The FOUNDRY

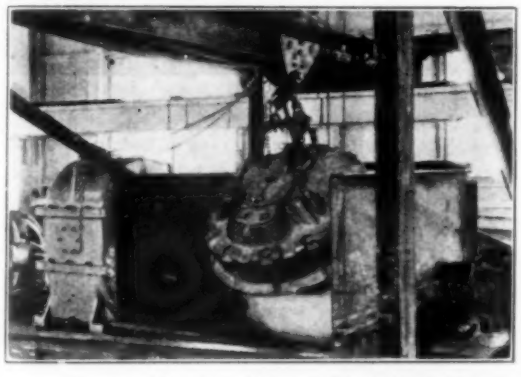
Volume 57
Number 7

Published
Semimonthly

CLEVELAND, OHIO, APRIL 1, 1929

Castings Speed Handling of Iron and Steel

EVER since man began building on a large scale, he has been confronted with the material handling problem. When Cheops, the ancient Egyptian king, decided to build the largest of the pyramids as a monument to himself, he placed 100,000 men at work building a causeway 3000 feet long from the quarry to the proposed structure. After 10 years of



Courtesy Ohio Electric & Controller Co.
Lifting Magnets, Made Chiefly of Castings, Are Employed Extensively in Handling Ferrous Materials

hard labor, the causeway was finished and then the same number of men began the construction of the pyramid, 20 years being required to finish the job. Similarly, thousands of men were needed to build the fine Roman aqueducts and other works. Labor was cheap in those early days, in fact most of the work was done by slaves. However, as civilization progressed, man's wants increased and he demanded higher wages. Machinery was developed as needs grew, until today, in the midst of the great era of machinery, equipment has been developed to accomplish much of the handling and carrying work. Of the many types of equipment employed by industry, the lifting magnet is used extensively in moving iron and steel both in the raw and finished state. That equipment is of special interest to the foundry industry, since, not only is it used to handle materials in and about the shop, but the bulk of parts from which the unit is built, are castings.

Find Where Castings Can Be Sold.

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PUBLISHED BY THE PENTON PUBLISHING CO., CLEVELAND, O.
BRANCH OFFICES

CHICAGO ..... 1147 Peoples Gas Bldg.
CINCINNATI ..... 209 Edwards Bldg.
NEW YORK ..... 2203-2206 No. 220 Broadway
PITTSBURGH ..... 2148-49 Oliver Bldg.
SAN FRANCISCO ..... 24 California Street
WASHINGTON, D. C. ..... 1653 Pennsylvania Avenue
BIRMINGHAM, ENGLAND ..... Prince's Chambers
LONDON, ENGLAND ..... 416-417 Caxton House, Westminster, S. W. 1
PARIS, FRANCE ..... No. 9 Rue de Londres
BERLIN, GERMANY ..... Wilhelmstrasse 114, Berlin S. W. 48

Cable address, IROTRAPEN, London

SUBSCRIPTION

United States and Mexico ..... $3.00 a year
Canada ..... $4.00 a year
Great Britain and other Foreign Countries ..... £1:0:0 a year
Single copies ..... 25 cents

Copies published three months or more previous to date of current issue, 50 cents each

Member, Audit Bureau of Circulations, Associated Business Papers Inc., National Publishers' Association

The A. B. P. is a nonprofit organization whose members have pledged themselves to a working code of practice in which the interests of the men of American industry, trade and professions are placed first—a code demanding unbiased editorial pages, classified and verified paid subscribers, and honest advertising of dependable products

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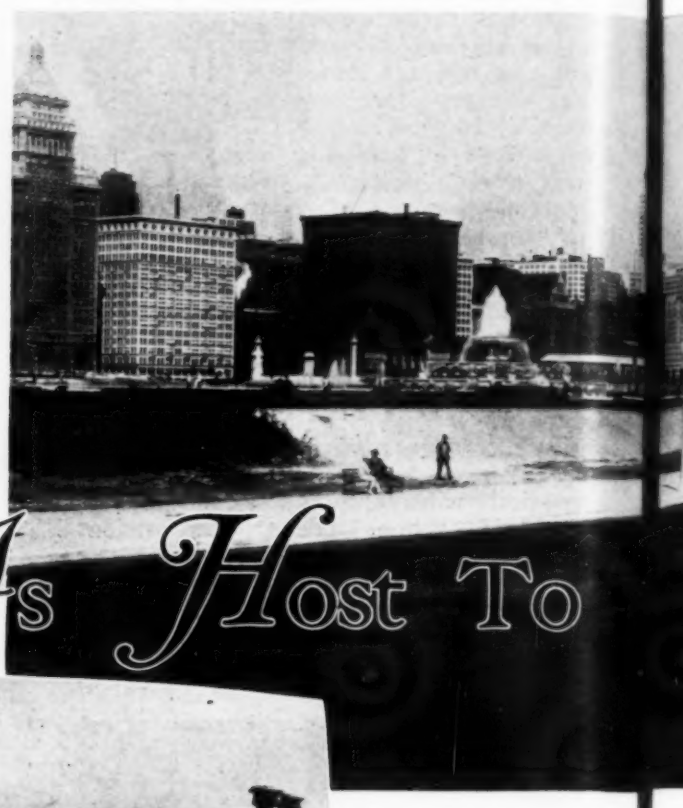
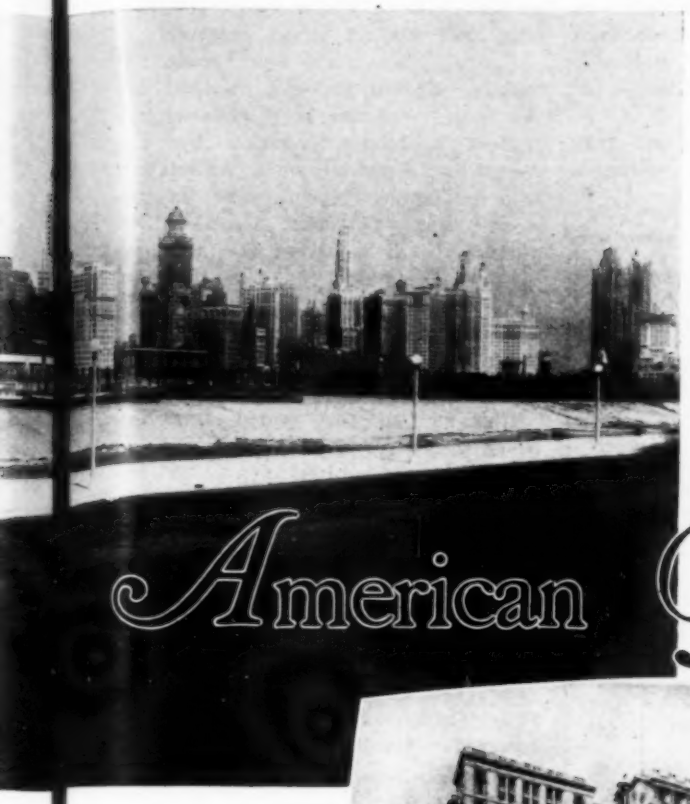


Chicago Is Host To

IN the heart of Chicago's Business Section Will Be Found Some of the Most Interesting of Modern Architectural Types

BUCKINGHAM Fountain Is But a Short Walk From the Headquarters Hotel

MANY unusual features will characterize the forthcoming Chicago convention of the American Foundrymen's association scheduled for April 8-11, 1929. For the first time in a number of years all of the activities of the convention will be housed under one roof. The spacious meeting rooms of the Hotel Stevens, the world's largest hotel, will provide facilities for technical sessions, round table discussions, shop operation courses and committee meetings. Along the halls and corridors will be found the exhibition of those committee activities of the association that lend themselves to this type of display. An unusual type of show of machinery, equipment and supplies will be offered under entirely new conditions. The Hotel Stevens possesses an extensive exhibition hall on the ground floor, directly accessible from the lobby floor. Here will be found an assembly of exhibits typifying practi-



American Foundrymen

CHICAGO'S Outer Drive Gives a Panorama of Lake Front Buildings

MICHIGAN Boulevard, the City's Most Beautiful Street, Passes the Door of the Convention Hotel

cally every feature of foundry design, mechanical operation and materials employed.

The technical sessions for the 1929 convention promise unusual interest. The type of papers selected will be of value to all identified with the foundry industry. The executive, the metallurgist, the engineer and the operating man all will find material of informative and educational value. Further, every branch of castings manufacture will be represented. Sessions on gray iron, steel, malleable and nonferrous practice will cover the entire range of these main divisions of the industry.

Questions of personnel also will have important consideration. A symposium on foreman training will be led by executives who have wide experience in training work and in planning special courses for beginners. Among these men are A. B. Peirce, director of Industrial Education, National Metal Trades association, M.

H. Mellon, supervisor of education, General Electric Co., West Lynn, Mass., and G. A. McGarvey, agent, industrial education, federal board for vocational education, Washington. Supplementing and supporting the informative material on apprentice training, R. E. Kennedy, technical secretary of the American Foundrymen's association, with members of individual committees has assembled patterns and castings made by apprentices from approximately 50 different foundries.

Two Meetings on Sand

FOUNDRY sands has proved a topic of absorbing interest during the past several years. Accordingly, two meetings will be devoted to this important subject. The first session will cover fundamentals of installing sand control methods supported by the opinions of men who have had practical experience. This meeting will be followed by a dinner after which the second session will feature reports of committees and discussions on sand handling and conditioning equipment.

Nonferrous foundry practice will be covered in two sessions. A round table luncheon meeting on brass, bronze and aluminum shop problems will be followed by a technical session devoted to nonferrous metallurgy and shop practice. Two papers on melting furnaces for nonferrous foundries will feature the latter session.

Shop operation courses inaugurated at the annual convention in Philadelphia last year proved both popular and valuable to those in attendance. Accordingly, a four period shop operation course on steel castings has been arranged. The subjects covered will include pouring practice, sand control, coreroom practice and heat treatment. Experts in each field will lead these discussions and those in attendance will be invited to ask questions and to contribute to the discussion. The technical papers and reports on alloy cast steels, grinding practice and specifications will be presented at the technical session. A round table luncheon meeting also has been arranged for steel foundrymen. This is the first time such a type of meeting has been held by a steel foundry group and much benefit should accrue from the unhampered interchange of opinion which develops.

One of the best programs ever provided for malleable foundrymen has been scheduled for the Chicago convention. Among the subjects covered by three important papers are "Controlling Atmosphere in Malleable Annealling Ovens," "The White Fracture Malleable" and "Investigations on Shrinkage." Sand control methods of particular value to the malleable foundry also will have attention at that session.

Many important papers on gray iron foundry practice are prepared for this convention. One by A. L. Boegehold, General Motors Corp., Detroit, will deal with the live problem of "How Casting Quality Is Affected by Blast Furnace Practice." High-test cast iron developments both in this country and abroad will pass in review at a symposium meeting scheduled for the final day of the convention.

In addition to the steel foundry operation course previously mentioned, the cupola operation course similar to that held in Philadelphia undoubtedly will attract great interest.

Convention Timetable

Monday, April 8

1 a.m. Exhibits open
P[illegible]istration
1.00 p.m. Committee Meetings
2:30 p[illegible]. Annual Business Meeting
4:00 p.m. Gray Iron and Steel Shop Operation Courses
6 [illegible]. Annual Exhibitors' Dinner
Dinner—Engineering and Shop Instructors
9: [illegible]
10:[illegible] a.m. Foun[illegible]
S[illegible]
[illegible]last Furnace Operation
[illegible]Pig Iron and Castings
12[illegible] p.m. [illegible]able Luncheon and M[illegible]on Nonferrous Foundry C[illegible] Methods
Round Table Luncheon and Meeting on Steel Founding
2:00 p.m. General Foundry Practice and Management
4:00 p.m. Fundamentals of Sand Control (The Gray Iron and Steel Shop Operation Courses scheduled for this time will be combined with this meeting.)
6:30 p.m. Dinner Gathering of Those Interested in Sand Control
7:30 p.m. Sand Control

Wednesday, April 10

9:00 a.m. Exhibits Open
10:00 a.m. Nonferrous Foundry Practice
Iron Foundry Practice
Materials Handling
12:30 p.m. Round Table Luncheon and Meeting on Nonferrous Shop Practice
2:00 p.m. Foreman Training
4:00 p.m. Gray Iron and Steel Foundry Shop Operation Courses
7:00 p.m. Annual Banquet

Thursday, April 11

9:00 a.m. Exhibits Open
10:00 a.m. Malleable Iron
Apprentice Training
12:30 p.m. Round Table Luncheon and Meeting on Malleable Iron Foundry Practice
2:00 p.m. High Test Cast Iron
4:00 p.m. Gray Iron and Steel Shop Operation Courses

Special plans have been made for making convention week pleasant for the ladies who are in attendance. A hostess has been engaged by the American Foundrymen's association who will supervise details of the various social features planned. Opportunity will be given for sightseeing in personally conducted parties, for shopping and for the many pleasant informal gatherings which mark the annual convention of the American Foundrymen's association.

Chicago is the world's leading foundry center. Accordingly, the opportunities for plant visitation are unusual. A great number of Chicago foundries, ranging from those making general jobbing work to the highly specialized foundries which will be found in this vicinity, have arranged to hold open house. Local committees, co-operating with the officials of the association, will be available to give full information regarding routes and hours for these plant visitations.

The exhibitors' dinner which is scheduled for Monday night, April 8, is sponsored jointly by the American Foundrymen's association and the Foundry Equipment Manufacturers association. This annual gathering of manufacturers of equipment and supplies always is marked by a spirit of enthusiasm and good fellowship.

On the same evening a dinner has been arranged for foundry instructors. On this occasion those identified with foundry education either through the established schools and universities or the various apprentice training organizations of the country will be in attendance.

The annual banquet which will be held Wednesday evening marks the high point of the week's entertainment features. A speaker of national prominence will address the members and guests who are present. The presentation of the Joseph S. Seaman medal awarded to the late Jesse L. Jones for distinguished service in the development of nonferrous casting practice has been announced for this meeting. This medal will be presented to one of the members of Mr. Jones' family.

Hold Business Meeting

THE annual business meeting will be held Monday at 2 p. m. to be followed by the first session of the steel foundry and the gray iron foundry shop operation courses which will continue at 4 o'clock on each of the following days of the convention. Monday morning has been set aside for meetings of various committees.

Schedule of Papers and Discussion

Monday, April 8

2:00 p.m.

Annual Business Meeting—Chairman: S. T. Johnston, President of the A. F. A.

4:00 p.m.

(a) First Session: Steel Foundry Shop Operations Course.
Subject—*Pouring Practice*—Chairman: C. H. Ring, Electric Steel Founders Research Group, Chicago.

(b) First Session: Gray Iron Foundry Shop Operation Course.
Subject—*Cupola Control*—Chairman: J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

Tuesday, April 9

10:00 a.m.

(a) FOUNDRY COSTS—Chairman: A. [illegible] Hageboeck, Frank Foundries Corp., Moline, Ill.
Practical Aspects of the Value of Foundry Cost Methods, by E. T. Runge, Cleveland.

(b) STEEL FOUNDING—Chairman: S. W. Utley, Detroit [illegible] Casting Co., Detroit.
Alloy Cast Steels, by H. A. Mason, Gould Coupler, N. Y.
Efficient Steel Casting Grinding, by F. A. Loren, American Steel Foundries, East Chicago, Ind.
Report of Investigation of Effects of Phosphorus and Sulphur in Steel, by R. A. Bull, Electric Steel Founders Research Group, Chicago.
Report of Committee on Steel Castings.

(c) CAST IRON METALLURGY—Chairman: H. W. Gillett, United States bureau of standards, Washington.
Quality of Pig Iron and Cast Iron as Affected by Blast Furnace Practice, by A. L. Boegehold, General Motors Corp., Detroit.

12:30 p.m.

(a) Round Table Luncheon and Meeting: *Uniform Nonferrous Cost Methods*—Chairman: E. B. Hazen, Brass Foundry Co., Peoria, Ill.

(b) Round Table Luncheon Meeting: *Steel Foundry Practice*—Chairman: R. J. Doty.

2:00 p.m.

GENERAL FOUNDRY MANAGEMENT AND PRACTICE—Chairman: Fred Erb.
Use of Scrap in Gray Iron, Malleable, and Electric Steel Mixtures, by E. K. Smith and F. B. Riggan, Stockham Pipe & Fittings Co., Birmingham, Ala.
Core Oil Testing and Specifications, by V. A. Crosby, Studebaker Corp., South Bend, Ind.
Safety and Sanitation in the Foundry, by F. H. Elam, American Steel Foundries, Chicago.
Science Hand in Hand with Labor, (Annual exchange paper of the Institute of British Foundrymen), by Frank Hudson, Glenfield and Kennedy, Ltd., Kilmarnock, Scotland.

4:00 p.m.

Second Session: Steel and Gray Iron Foundry Shop Operation Course.
Subject—*Sand Control Fundamentals*—Chairman: R. A. Bull.
Sand Control in a Malleable Foundry, by W. Ranis, Union Malleable Iron Co., Moline, Ill.
Sand Control in Gray Iron Foundries, by R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston.
Reduction of Scrap, by E. W. Smith, Crane Co., Chicago.
Sand Control in a Steel Foundry, by H. A. Mason, Gould Coupler Co., Depew, N. Y.

6:00 p.m.

Dinner Meeting: For those interested in sand control.

7:30 p.m.

SAND CONTROL—*Practice and Research Developments*—Chairman: R. A. Bull.
Review of Sand Handling Installation Problems.
Report of Committee on Molding Sand Research.
Sound Castings, by R. W. Kurtz, Jas. B. Clow and Sons, Newcomerstown, Ohio.
Some Experiments in Sand Control, by E. F. Wilson, Jefferson-Union Co., Holyoke, Mass.
The Refractoriness of Foundry Sands, by J. F. McMahon, Mines Branch, Dept. of Mines, Ottawa, Canada.

Wednesday, April 10

10:00 a.m.

(a) NONFERROUS FOUNDRY PRACTICE—Chairman: G. H. Clamer, Ajax Metal Co., Philadelphia.
Some Practical Problems in the Brass Foundry, by H. J. Roast, National Bronze Co., Ltd., Montreal, Quebec, Canada.
An Open-Flame Hearth-Type Furnace for Melting Aluminum and Its Alloys, by R. J. Anderson, G. E. Hughes, and M. B. Anderson, Fairmont Mfg. Co., Fairmont, W. Va.
Electric Arc Furnaces in General Jobbing Brass Foundry, by J. B. Meier, F. & H. Foundry Co., Newark, N. J.
Report of Chairman of Division of Nonferrous Foundry Practice.

(b) IRON FOUNDING PRACTICE—Chairman: R. F. Harrington, metallurgist, Hunt-Spiller Mfg. Corp., Boston.
A Study of 26-Inch Cupola Operation, by F. B. Coyle, International Nickel Co., New York.
An Analysis of 54-Inch Cupola Performance, by E. E. Marbacker, Whiting Corp., Pittsburgh.
Investigation of Causes of Defective Castings for Enameling Ware, by C. J. Scullin, Tucker-Scullin Inc., St. Louis.
Report of Chairman of Division of Gray Iron Foundry Practice.

(c) M[illegible]IALS HANDLING—Chairman: D. M. Avey, THE FOUNDRY, [illegible]land.
Mod[illegible]dling, by R. J. Heisserman, Link-Belt Co., Philadelp[illegible]
Materials Handling in the Foundry, by A. Walton, Philadelphia.

12:30 p.m.

Round Table Luncheon and Meeting: *Nonferrous Shop Practice*—Cha[illegible]: J W. Bolton, The Lunkenheimer Co., Cincinnati.

2:00 p.m.

FOREMAN [illegible]ING—*A Symposium*—Chairman: B. H. Johnson, Morris Co., Philadelphia.
[illegible]ssion of the symposium will be led by men promi[illegible]n the foreman training movement. The object of [illegible]eting will be to show what has been accomplished [illegible] adequate training is had in foundry organizations.
Coleman, W. A. Jones Foundry & Machine Co., Chi-
[illegible]eirce, director, department of industrial education, [illegible]al Metal Trades association, Chicago.
[illegible]ellen, supervisor of education, General Electric Co., Lynn, Mass.
G. A [illegible]cGarvey, agent, industrial education, federal board [illegible]f[illegible]ocational education, Washington.
A. [illegible] Lynch, personnel director, Ohio Brass Co., Mansfie[illegible] O.
L. A Hartley, educational director, National Founders association, Chicago.

4:00 p.m.

(a) Third Session: STEEL FOUNDRY SHOP OPERATION COURSE.
Subject—*Core Room Practice*—Chairman, A. C. Jones, metallurgist, Lebanon Steel Foundry, Lebanon, Pa.

(b) Third Sessions: GRAY IRON FOUNDRY SHOP OPERATION COURSE.
Chairman: H. W. Dietert, U. S. Radiator Corp., Detroit.

Thursday, April 11

10:00 a.m.

(a) MALLEABLE IRON FOUNDRY PRACTICE—Chairman: F. J. Lanahan.
Controlling the Atmosphere in Malleable Annealing Ovens, by W. F. Graham, Ohio Brass Co., Mansfield, Ohio.
Practical Aspects of White Fracture Malleable Iron, by Duncan Forbes, Rockford-Northwestern Malleable Corp., Rockford, Ill.
Shrinkage in Malleable Iron Castings, by H. A. Schwartz, National Malleable and Steel Casting Co., Cleveland.
Report of Representative on Committee Advisory to bureau of standards, by J. B. Deisher, Rochester, N. Y.
Report of Chairman of Division of Malleable Iron Foundry Practice.

(b) APPRENTICE TRAINING—Chairman: L. A. Hartley.
Report of Committee on Training of Apprentices.
Why We Train Apprentices, by J. A. Davies, Westinghouse Electric & Mfg. Co., Philadelphia.
Discussion—Led by A. E. Harrison, Allis-Chalmers Mfg. Co., Milwaukee.
How We Train Apprentices, by A. M. Cornell, Pettibone-Mulliken Co., Chicago.
Discussion—Led by C. D. Carey, American Steel Foundries, Verona, Pa.

4:00 p.m.

(a) Round Table Luncheon and Meeting: *Malleable Iron Foundry Practice*—Chairman: Scott Mackay, University of Wisconsin, Madison, Wis.

2:00 p. m.

HIGH TEST CAST IRON. *A Symposium*. Chairman: H. F. Moore, University of Illinois, Urbana, Ill.
European Developments:
Dr. E. E. Marbaker, Mellon Institute of Industrial Research, Pittsburgh.
Dr. Fritz Meyer, National Radiator Corp., Johnstown, Pa.
American Developments:
F. B. Coyle, International Nickel Co., New York.
R. S. McCaffery, department of metallurgy, University of Wisconsin, Madison, Wis.
R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
H. Bornstein, Deere & Co., Moline, Ill.
O. Smalley, Brooklyn, N. Y.

4:00 p. m.

(a) Fourth Session: Gray Iron Foundry Shop Operation Course.
Subject—*Cupola Control—Melting Operation*—Chairman: C. J. Scullin.

(b) Fourth Session: Steel Foundry Shop Operation Course.
Subject—*Heat Treatment of Steel Castings*—Chairman: John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

C. E. Hoyt, Executive Secretary and Treasurer, Manages Association's Business Affairs

How the A. F. A.

WHERE would the American foundry industry stand today had it not been for the establishment of the American Foundrymen's association at Philadelphia in May, 1896? Would castings manufacture occupy its present high plane of efficiency had not the American Foundrymen's association contributed in such marked degree to advancing thought along scientific, technical, practical and mechanical lines?

Perhaps, it might be suggested, if this useful organization had not been established, America's wonderful genius for organization would have provided for the foundry industry some other medium for the compilation and dissemination of information. Destiny seems always to produce a Washington or a Lincoln to meet the political and economic needs of America. Perhaps that same agency that guides our governing functions conceived and inspired the organization, progress and accomplishments of the American Foundrymen's association.

It seems fitting that on this occasion, the Thirty-third annual convention and exhibition to be held in Chicago, the headquarters city of the A.F.A., that special attention should be given to the American Foundrymen's association. Accordingly, this and a number of following pages in THE FOUNDRY have been dedicated to a detailed study of the association, its plan, its work and its ambitions.

This material has been compiled through the co-operative effort of the entire staff of THE FOUNDRY. For example, a man whose early training was received on the molding floor, who was advanced to foremanship and attained a superintendent's position has viewed the association from the standpoint of the practical man. A university trained man identified with various large organizations as chemist and metallurgist presents the viewpoint of the technical and scientific accomplishments. Another, an engineer by training, has studied the progress along mechanical lines that may be attributed in a large measure to the American Foundrymen's association. A man identified with the international movement from its inception prepared the comments on that activity.

The American Foundrymen's association is known to its members only through occasional contacts at conventions, by comment in the business press or through the *Transactions* or *Bulletins* of the association. The foundryman who

R. E. Kennedy, Technical Secretary, Is Responsible for Convention and Committee Work

A. Serves the Industry

The American Foundrymen's association is the one common friend and champion of all classes of American foundries. Its services are offered freely to advance steel, malleable, gray-iron and nonferrous foundries alike and its record of accomplishment contains many valuable contributions to all of these classes. In this manner it differs from a trade association which primarily must act selfishly in the interest of the particular branch or division which it serves. However, the facilities of the American Foundrymen's association in promoting research along technical lines have been found invaluable aids to trade associations representing the different groups of the foundry industry.

is not a member, perhaps is even less well informed as to what the association is and what it has meant to him in providing better methods for carrying on his daily business. Both the member and non-member, active foundrymen, operating men, executives or owners will do well to become better acquainted with the A.F.A. This acquaintanceship by no means should be remote. The man who profits most from the association is he who contributes most freely of his time and talent to furthering its work.

Primarily, the American Foundrymen's association is a technical organization devoted to the improvement of the castings industry. It carries on such work as the compilation of cost systems, the study of apprenticeship and safety measures, the recommendation and adoption of standards of practice and such investigations and researches as may be fostered in the interest of technical advancement. Its membership includes foundrymen of all classes, educators, equipment and supply manufacturers and the business and technical press. The co-operative efforts of all these component classes are directed to furthering, for the good of the industry, the aims previously stated.

The non-member of the association may inquire, "How does the American Foundrymen's association carry on its work?"

The association activities may be broadly divided as those relating to the technical phases such as the encouragement of papers presented at annual meetings and later made available through the *Transactions*, active committee work dealing with specific problems and the co-operative activities carried on with other technical societies. A study of the organization chart shown on page 268 gives a clear conception of the many ramifications of technical activities that are so han-

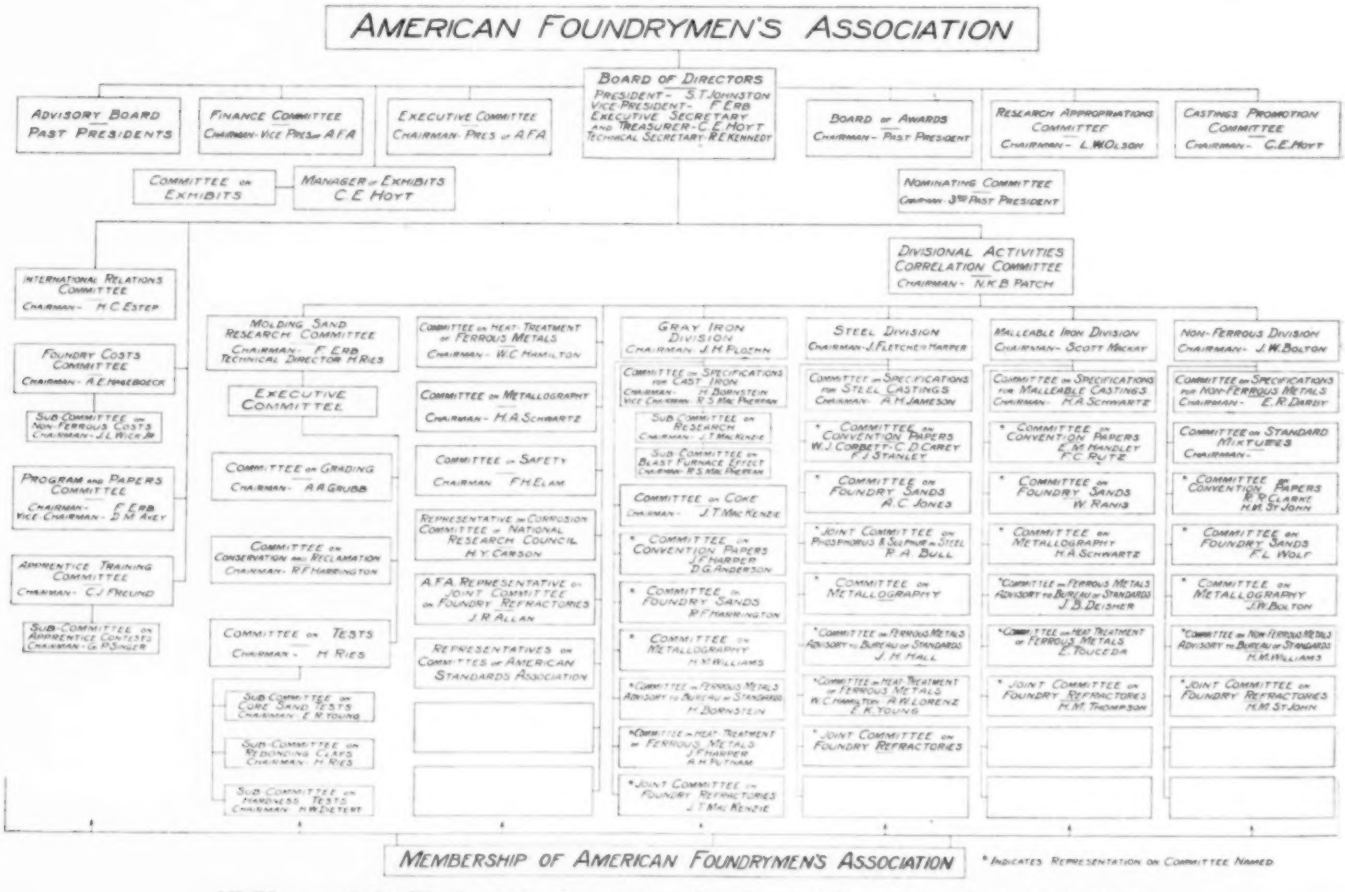
An Efficient Office Staff Handles the Many Duties of Routine and Correspondence

dled. This work is carried on under direction of C. E. Hoyt, executive secretary, with Robert E. Kennedy, technical secretary, immediately in charge.

The second major activity is the arrangement and managing of exhibitions of equipment, materials and supplies. Since the first few years of it's history these exhibitions have been held each year with but few exceptions. A large measure of the advance made in mechanization may be credited directly to the exhibitions held by the American Foundrymen's association. The chronology of the association shown on following pages will give a comprehensive idea of the growth and development of the exhibitions. However, the great advance in foundry methods due in large part to this service feature of the A.F.A. can be understood and appreciated only by a comparison of methods and equipment prior to it's conception and those which are the rule rather than the exception in the modern American foundry.

The actual government of the association is vested in a board of directors consisting of fifteen men each of whom is elected for a period of three years. These directors, all of them

(*Concluded on Page* 273)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CHAIRMAN - F. H. ELAM
REPRESENTATIVE ON CORROSION COMMITTEE OF NATIONAL RESEARCH COUNCIL
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A.F.A. REPRESENTATIVE ON JOINT COMMITTEE ON FOUNDRY REFRACTORIES
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leading figures in the foundry industry, contribute unselfishly of their time and efforts in the promotion of their association. The officers of the association consist of a president, vice president, executive secretary and treasurer and the technical secretary. An executive committee provides a means for prompt action on matters of business or policy. Committees on finance, on awards, on research appropriations and castings promotion make up the active working organization of the board. They are supplemented by an advisory board composed of past presidents.

As may be noted from the organization chart, a number of main divisions have been set up, each charged with the activities of some particular branch or important division of the foundry industry. For example, molding sand, a subject of general interest to all foundries, has a working research committee with various subcommittees under its immediate control. Committees on heat treatment, metallography, safety and various other subjects relating to the entire industry and spreading over all have the various functions named in their immediate charge. Further, the main divisions, gray iron, steel, malleable iron and nonferrous have their general supervision all working under a correlation committee which ties in all interests and prevents duplication. The personnel of these committees is shown in accompanying pages.

A fact worthy of note as being unusual in association work, is the fact that committees are *active* in the American Foundrymen's association. If they become inactive or if the need for their services no longer exists, these committees are abated and no dead wood is carried in the organization.

Freely Give—Freely Get

WHILE the American Foundrymen's association does not engage in research, its members, working through the association, have contributed much of the research information at present available on cast metals, on raw materials and on processes. The spirit of the American foundryman, which is exemplified by his willingness always to pass on any knowledge which he may have, finds it's best expression through the American Foundrymen's association. Had it not been for this free exchange of information, the industry would not occupy the place which it does today.

The active business of the association is transacted through the offices of the association at 222 West Adams street, Chicago. C. E. Hoyt, executive secretary and treasurer, is the active manager of association affairs. In addition to these duties, Mr. Hoyt is manager of exhibitions and carries on the multitudinous duties of making preliminary arrangements, assembling and conducting exhibits which are among the largest held by any industry or organization in this country.

Robert E. Kennedy, technical secretary, directs the work of securing, preparing and presenting scientific papers and arranging the meetings at annual technical conventions. He works actively with the papers committee and, in fact, with practically all of the committees of the association. He obtains the technical papers, edits them for preprinting prior to the conventions and publishes them in the *Transactions* issued after each convention. Furthermore, he is actively in charge of publishing the *Bulletin* devoted to news of the association and its affairs which appears quarterly.

In addition to its service along technical and scientific lines, available to all foundrymen, the service of this trained staff is invaluable to members through the interchange of information of a personal value.

Recently, the board of directors has authorized the establishment of a castings promotion committee, headed by the executive secretary. This committee, which is just being organized has for its purpose the furthering of cast products of all classes. It will assemble and circulate engineering data relating to the merits and service possibilities of castings. It will educate engineers, manufacturers and consumers to a better understanding of the part played by castings in the modern industrial world. Finally, it will act as a defensive and militant agency against ill advised and untrue assaults of competing materials and products, which in recent years have made all cast products their target.

The following pages present a more detailed summary of the individual accomplishments, purposes and plans of the association.

Gives New Working Tools to the *Practical Man*

SINCE its inception the American Foundrymen's association has followed a consistent policy of investigating problems and disseminating information for the benefit of the man in the shop, the man primarily responsible for the production of saleable castings in ferrous and nonferrous metals.

Commencing on a modest scale, the scope of its activities in this respect has broadened with the years and with the power and prestige inevitably accruing through the accumulated experiences freely contributed by practically all the prominent men engaged in the foundry industry.

The association has been extremely fortunate in the character and attainments of the wide circle of men included in its membership; men who have been actuated by the commendable impulse that places the common good above private and selfish consideration; men who cheerfully have given of their time, talents and experience to the end that the foundry industry may hold its place in the vanguard of the basic industries on which civilization marches forward.

More than any other factor, the American Foundrymen's association has been responsible for raising the general standard of foundry knowledge among those engaged actively in the industry. It has collected and correlated the knowledge of the leaders and scientists and reduced this knowledge to simple terms and then broadcast it for the benefit of men who have to apply it.

As a result, thousands of foundrymen, denied through lack of time, opportunity, or through force of circumstances, the benefits of a scientific education, now carry on their operations fortified by a working knowledge of the basic principles involved.

To a great extent the old hit-or-miss, cut-and-try methods have been eliminated in the foundry, principally through the persistent effort and campaign of education conducted by the American Foundrymen's association.

Effort Rewarded

PREVIOUS to the formation of the joint committee on molding sand research, Oct. 28, 1921, a great deal of effort had been put forward by individuals in a small way in furthering sand testing and conservation. However, it was not until this committee began to function that the early investigator was furnished with the proper tools to carry on his work in the way of carefully developed method of test.

Continued activity of the American Foundrymen's association through its joint committee on molding sand, has resulted in the development of various tests which now have become standard or tentative standard and have thus placed in the hands of the foundryman, methods which enable him intelligently to carry on control testing in the foundry and at the same time provide means of comparison. In my opinion it has conferred untold benefits on the foundry industry, not only in the sense that it has furnished test methods, but because it has served to arouse and maintain continued interest on the part of the man in the shop in scientific methods of foundry sand control and research. This interest has contributed to the end for which every foundryman is striving, better castings at lower cost.

R. F. HARRINGTON,
Boston.

The result has not been confined to those who hold membership in the association. With the constant shifting of personnel incident to a healthy, vigorous and expanding industry, it is inevitable that the seeds of knowledge however sparsely scattered in the first place, gradually should leaven the entire body of men with common aims and aspirations.

Whether acquired directly or indirectly, the statement safely may be made that the American Foundrymen's association is largely responsible for the general knowledge displayed by foundrymen in this country in the practical every-day operation of their plants. At a comparatively early date most of the broad, general principles underlying foundry practice were established. In recent years most of the work has been directed to the pursuit of the more specialized and in many instances, obscure features which still persist and elude a definite pinning down. Committees and individual investigators continue work in this field.

For example, as a result of the work already accomplished on pig iron and iron castings practically all members of the present generation of foundrymen, foremen, superintendents and others to whom the knowledge is an asset, possess and exercises a working knowledge of the chemical composition of iron. The information has been compiled and standardized in a simplified manner easily assimiliated by the man who has to use it.

Hyman Bornstein, Chairman, Committee on Cast Iron Specifications

Reduced to Rules

THE essence of all the information gained by highly skilled scientists over a period of many years has been distilled into a few simple rules that can be learned as readily as the multiplication table, or the ability to drive an automobile. Millions of people who drive motor cars have not the least conception of the construction or operation of the power plant under the hood, or of how the energy from a gallon of gas is applied. Similarly thousands of foundrymen unacquainted with chemistry can mix irons to produce a standard analysis casting.

The same general idea has been followed in devising the tests by which a foundryman may keep intelligent check on his practice. From a technical standpoint the perfect test bar has not yet been developed, but those that have been adopted serve the needs of the practical foundryman for all ordinary purposes. Strength and rigidity are the outstanding characteristics required in cast iron. The tensile test and the transverse test on the 1.2-inch bar indicate the strength of the material and the extent to which it will resist stresses of various kinds.

A. H. Jameson, Chairman, Committee on Steel Specifications

By standardizing the shape and size of the test bar, also the manner in which it is molded, poured and placed in the testing machine, the association enabled foundrymen whether close together or in widely separated places, to make comparisons and draw conclusions in an intelligent manner. In

Made Early Tests

THE first comprehensive paper on testing molding sands was presented by Dr. H. Ries at the Cleveland convention in 1906. This was followed at other conventions by papers on waste and core sands. In 1912 Dr. Richard Moldenke reported on the examination of 80 samples of natural molding sands and 12 samples of artificial molding sands. He also originated the fineness test, transverse test, crushing test, permeability test and test for determining the clay bond. Other men assisted in making photomicrographs, the rational analyses and the identification of the mineral constituents. A summary of these tests and their importance to the foundry industry was presented by Dr. Moldenke at a later convention.

Several papers presented at the Atlantic City convention in 1915 indicated the rising interest of the association in the subject. The papers dealt with molding sand deposits, characteristics of molding sands and reclamation of molding sand. Later the association appointed a committee advisory to the United States bureau of standards and this resulted in the adoption of standard sieves. Continued interest in sands and the demand for information upon their properties and methods of testing, led the American Foundrymen's association in 1921 to organize a committee for the purpose. The National Research council was invited to co-operate. The committee, known as the joint committee on molding sand research, was organized in December, 1921, under the chairmanship of R. A. Bull.

WALTER M. SAUNDERS,
Providence, R. I.

addition to further investigation on the subject of testing methods, the American Foundrymen's association has a large and active committee engaged in the work of drawing up specifications for cast iron. A subcommittee functions on problems of research and a second subcommittee is carrying on extensive investigation of the effect of varying blast furnace operations on the quality of the resultant pig iron. The work to date of this second subcommittee has helped to clear up many phases of this highly involved situation and brought blast furnace operator and foundryman closer together to their mutual advantage.

In fact, this consistent attitude of reducing problems to their simplest terms, translating the factors and conclusions into brief and easily understandable language, has characterized the greater part of the American Foundrymen's association work since the beginning. Many of the preliminary steps have taken the investigators down strange and little traveled bypaths of abstract science, but almost invariably, these industrial and scientific hunters have returned to the familiar ground occupied by the ordinary foundryman and have explained for his benefit, the result of the expedition. Abstract theory and laboratory experiment have been adjusted and adapted to meet prosaic shop conditions.

J. T. MacKenzie, Chairman, Sub-Committee on Research

Pooled Knowledge

REALIZING a need of the industry, the American Foundrymen's association secured the co-operation of the American Society for Testing Materials and the National Research council and formed the joint committee on molding sand research. Here and there men had been at work studying sands for some years. In the foundries, in the laboratories of foundries, of sand producers, of colleges, of government bureaus, commercial chemists and metallurgists, investigators had been seeking to uncover the properties of sands and to find means of measuring them that they might compare one sand with another. The joint committee included or called many of these men and from them were built the sub-committees on geological surveys, grading, reclamation and tests.

To the meetings of these committees were brought knowledge, ideas, theories, experiences, crude testing apparatus and much enthusiasm for the work. Ideas were pooled, knowledge, experience, theories and hopes were thrown into a common melting pot. From it were drawn concrete ideas which were tested in a small way and later in a larger way and under different conditions and in difference places. The result was the gift to the foundry world of the American Foundrymen's association clay grades, grain classification and the standard and tentative methods of testing.

R. J. DOTY,
Reading, Pa.

Cupola Given Attention

CUPOLA practice in all its various phases has received a considerable amount of attention from the American Foundrymen's association. The program of papers presented at every convention has contained several devoted to theory and description of the manner in which iron is melted in this device. Subject matter of the papers and ensuing discussion among those properly qualified to discuss the many features of the problem, alike have helped to clarify the situation and reduce a somewhat mysterious process to one readily within the grasp of those who actually have to produce suitable iron at the spout to meet either ordinary or extraordinary conditions.

J. Fletcher Harper, Chairman, Steel Division

At the Philadelphia convention a year ago, the association set apart a special session each day for the purpose of familiarizing those in attendance with the salient features of cupola theory and practice. No formal papers were presented, but a recognized authority each day outlined one or a group of related features and then invited and stimulated discussion from the floor. Gratifying interest shown by the large number who attended these sessions last year indicated that the association is keeping closely in touch with the needs of the practical man. This year the idea has been elaborated and extended to include a series of sessions on steel and gray iron shop operation.

From the foregoing it is apparent that the association is now and always has been keenly interested in the many problems of actual shop practice. In the present instance some

(*Concluded on Page 278*)

Energizes Measures

IN 1922 the American Foundrymen's association appointed C. R. Messinger as a representative to work with the American Society for Testing Materials and other associations, to the end that closer co-operation might be secured in the formation of specifications. Through this closer co-operation the association has been able to work along the lines of broadening specifications for cast iron and the classification of various types of castings. The effort has been slow on account of the wide variety of castings and the almost endless variation in analyses.

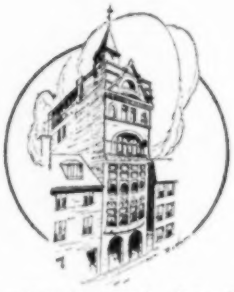
The American Foundrymen's association has not limited itself to the field of specifications. It is attempting to list all the properties of gray iron and to uncover a method, or a yard stick which will determine these various properties. A method has been developed for temperature measurement and men now are working on a method to determine liquid shrinkage. The next move will be to determine methods for the examination of fluidity and solid contraction in cast iron. Determination of the proposed yard stick will lead to a closer connection between specifications and the actual materials entering the castings. Adoption of the yard stick will insure a better grade of cast iron and a better understanding of its properties.

E. J. LOWRY,
Detroit.

Compact Chronology of the Association

COMPILED FROM THE FILES OF THE FOUNDRY FOR THE PAST THIRTY-THREE YEARS

1896
PHILADELPHIA
May 12-14



Meetings—Manufacturers' club, Franklin institute
Officers elected—President—Francis Schumann
Vice Presidents—F. W. Gibby, Robert G. Taylor, Henry Clay Evans, John M. Sweeney, W. S. Mosher, Irving Scott, Joseph Best
Secretary—John A. Penton
Treasurer—Howard Evans
Membership—345 Attendance—345
Papers—8
Constitution drawn up and adopted.

1897
DETROIT
May 10-13

Meetings—Harmonie Hall
Officers elected—President—Francis Schumann
Vice Presidents—W. E. Sessions, I. N. Frank, E. H. Putnam, C. S. Bell, C. J. Wolff, W. S. Mosher
Secretary—John A. Penton
Treasurer—Howard Evans
Membership—486 Attendance—177 Exhibitors—24 Papers—9
Constitution amended, Committee on Industrial Education appointed.

1898
CINCINNATI
June 7-10

Meetings—Convention hall of Grand hotel
Officers elected—President—C. S. Bell
Vice Presidents—C. L. Newcomb, I. N. Frank, E. H. Putnam, C. A. Bauer, C. J. Wolff, W. S. Mosher
Secretary—John A. Penton
Treasurer—Howard Evans
Membership—566 Attendance—287
Papers—12
Committee for standards on test bars appointed. Committee for standardizing chemical analysis appointed.

1899
PITTSBURGH
May 16-19

Meetings—Club rooms of the Monongahela house
Officers elected—President—J. S. Seaman
Vice Presidents—A. W. Walker, Dr. Richard Moldenke, J. P. Golden, C. A. Bauer, W. A. Jones, W. S. Mosher, R. Chartrey, Joseph Best
Secretary—John A. Penton
Treasurer—Howard Evans
Membership—310 Papers—9
American Foundrymen's association standardizing bureau formed.

1900
CHICAGO
June 5-7

Meetings—Great Northern hotel
Officers elected—President—W. A. Jones
Vice Presidents—George B. Buckingham, William Yagle, J. P. Golden, John A. Penton, William Ferguson, W. S. Mosher, R. Chartrey, T. J. Best
Secretary—Dr. Richard Moldenke
Treasurer—Howard Evans
Membership—341 Papers—9

1901
BUFFALO
June 4-6

Meetings—Seventh-fourth Regiment, N. Y. N. G. Armory
Officers elected—President—J. G. Sadlier
Vice Presidents—T. H. Colin, Walter F. Prince, S. D. Sleeth, C. A. Bauer, F. W. Smith, E. P. Gilmour, J. P. Golden, T. J. Best
Secretary—Dr. Richard Moldenke
Treasurer—Thomas D. West
Membership—297 Attendance—195
Papers—13
Committee on uniform methods of making chemical tests on cast and pig iron appointed. Proposed standard specifications for gray iron castings drawn up.

1902
BOSTON
June 17-19

Meetings—Huntington hall, Massachusetts Institute of Technology
Officers elected—President—Arthur W. Walker
Vice Presidents—J. F. Lanigan, J. A. Beckett, F. H. Zimmers, A. I. Findley, C. J. Wolff, Adam W. Bair, J. P. Golden, T. J. Best
Secretary—Dr. Richard Moldenke
Treasurer—Willis Brown
Membership—314 Attendance—241
Papers—12
Committee on specifications for steel castings, and committee on insuring patterns appointed.
Chemical section of A.F.A. organized.
Affiliation of Associated Foundry Foremen with A.F.A.

1903
MILWAUKEE
June 9-11

Meetings—Club room of the Hotel Pfister
Officers elected—President—Willis Brown
Vice Presidents—John Magee, J. A. Beckett, John McLaren, A. K. Beckwith, C. J. Wolff, Adam W. Bair, J. P. Golden, T. J. Best
Secretary and Treasurer—Dr. Richard Moldenke
Membership—317 Attendance—243
Papers—22
Appoints committee on foundry practice.

1904
INDIANAPOLIS
June 7-9

Meetings—Claypool hotel
Officers elected—President—C. J. Wolff
Vice Presidents—E. W. Anthony, John Mills, D. J. Thomas, A. K. Beckwith, H. E. Diller, T. W. Sheriffs, J. P. Golden, T. J. Best
Secretary and Treasurer—Dr. Richard Moldenke
Membership—278 Attendance—157
Papers—25
Journal of the association enlarged. Committee on hardness of molds appointed. Committee on standard specifications for coke appointed. Pig iron specifications changed.

1905
NEW YORK
June 6-8

Meetings—Grand Central palace and Columbia university
Officers elected—President—Thomas D. West
Vice Presidents—Harry A. Carpenter, H. Van Atta, A. V. Slocum, A. K. Beckwith, David Spence, Adam W. Bair, J. P. Golden, T. J. Best
Secretary and Treasurer—Dr. Richard Moldenke
Membership—294 Attendance—262
Papers—19
Standard method for the determination of silicon in pig and cast iron recommended.

1906
CLEVELAND
June 5-7

Meetings—Central Armory
Officers elected—President—W. H. McFadden
Vice Presidents—C. J. Caley, John W. Burr, Stanley C. Flagg, Jr., J. H. Whiting, W. J. Keep, Thomas W. Sheriffs, J. P. Golden, L. L. Anthes
Secretary and Treasurer—Dr. Richard Moldenke
Membership—300 Attendance—582
Papers—28 Exhibitors—42
American Foundrymen's Supply association organized. Committee appointed to study the effect of nickel on cast iron. Committee on cost finding appointed. Journal changed to Transactions.

1907
PHILADELPHIA
May 21-23

Meetings—Second Regiment Armory
Officers elected—President—Stanley G. Flagg, Jr.
Vice Presidents—C. J. Caley, John W. Burr, H. E. Field, J. H. Whiting, A. K. Beckwith, T. W. Sheriffs, J. P. Golden, L. L. Anthes
Secretary and Treasurer—Dr. Richard Moldenke
Membership—532 Attendance—1391
Papers—34 Exhibitors—75
Standard methods for the determination of graphitic and total carbon, manganese, sulphur and phosphorus recommended. American Brass Founders' association organized. Later became Institute of Metals. Committee on accident prevention appointed.

1908
TORONTO, CANADA
June 8-12

Meetings—Exhibition park
Officers elected—President—L. L. Anthes
Vice Presidents—F. B. Farnsworth,

Compact Chronology of the Association

William H. Parry, H. E. Field, J. W. Jeffrey, Samuel T. Johnson, T. W. Sheriffs, J. W. Kissick, R. [illegible] Cluff

Secretary and Treasurer—Dr. Richa[illegible] Moldenke

Membership—715 Attendance—1[illegible]

Pape[illegible]—33 Exhibitors—62

Resolution passed to abolish the gra[illegible]g of pig iron by numbers and subst[illegible]e chemical analysis as the governing [illegible]e-tor and committee appointed to [illegible]rk with a similar committee of the [illegible]er-ican Society of Testing Materi[illegible] to this end. Committee appointed [illegible] investigate accidents in foundries.

1909

CINCINNATI

May 17-22

Meetings—Music hall

Officers elected—President—Arthur T. Waterfall

Vice Presidents—F. B. Farnsworth, Walter Wood, Joseph T. Speer, Eugene W. Smith, T. W. Sheriffs, A. E. Howell, William Gilbert, A. N. W. Clare

Secretary and Treasurer—Dr. Richard Moldenke

Membership—724 Attendance—2000

Papers—18 Exhibitors—68

Committee on analysis of brass and kindred alloys appointed. Standard specifications for buying foundry pig iron adopted.

1910

DETROIT

June 6-10

Meetings—Michigan State Fair Grounds

Officers elected—President—Major Joseph T. Speer

Vice Presidents—F. B. Farnsworth, Walter Wood, W. A. Bole, William Gilbert, J. J. Wilson, T. W. Sheriffs, A. E. Howell, A. N. W. Clare

Secretary and Treasurer—Dr. Richard Moldenke

Membership—753 Attendance—2000

Papers—18 Exhibitors—84

Coke specifications suggested. Program committee appointed.

1911

PITTSBURGH

May 23-26

Meetings—Western Pennsylvania Exposition society

Officers elected—President—Major J. T. Speer

Vice President—F. B. Farnsworth, H. D. Miles, Walter Wood, A. E. Howell, R. A. Bull, T. W. Sheriffs, G. R. Lombard, S. B. Chadsey

Secretary and Treasurer—Dr. Richard Moldenke

Membership—692 Attendance—2000

Papers—47 Exhibitors—112

First bound volumes of the transactions appeared. Adopted standard methods for determining the constituents of foundry coke. Committee appointed to suggest uniform report form for chemical analysis.

1912

BUFFALO

Sept. 24-26

Meetings—Broadway Exposition building, Hotel Statler

Officers elected—President—H. D. Miles

Vice Presidents—F. B. Farnsworth, T. L. Richmond, Walter Wood, A. E. Howell, R. A. Bull, T. W. Sheriffs, G. R. Lombard, S. B. Chadsey

Secretary and Treasurer—Dr. Richard Moldenke

Membership—626 Attendance—3000

Papers—30 Exhibitors—105

Committee appointed to change constitution and by-laws. Committee on standardization of core binders appointed. Name of the American Brass Foundrymen's association changed to the American Institute of Metals during the year.

1913

CHICAGO

Oct. 14-18

Meetings—International amphitheater, LaSalle hotel

Officers elected—President—Alfred E. Howell

Vice Presidents—R. A. Bull, H. A. Carpenter, S. B. Chadsey, G. R. Lombard, T. L. Richmond, T. W. Sheriffs, J. J. Wilson, Walter Wood

Secretary and Treasurer—A. O. Backert

Membership—715 Attendance—Large

Papers—40 Exhibitors—158

Joseph S. Seaman given silver loving cup by the association. Committee on steel foundry shop standards appointed. Cost committee reappointed. Committee on safety reappointed. Committee on papers and program appointed.

1914

CHICAGO

Sept. 7-11

Meetings—LaSalle hotel, International amphitheatre

Officers elected—President—R. A. Bull

Vice Presidents—H. E. Field, Henry Carpenter, Walter Wood, T. W. Sheriffs, A. T. Drysdale, J. J. Wilson, A. H. Thomas, Ben D. Fuller

Secretary and Treasurer—A. O. Backert

Membership—760 Attendance—Large

Papers—40 Exhibitors—137

Committee on specifications for foundry scrap appointed. Constitution amended. Committee on international meeting appointed.

1915

ATLANTIC CITY

Sept. 27-Oct. 1

Meetings—Young's million dollar pier

Officers elected—President—R. A. Bull

Vice Presidents—J. P. Pero, Henry A. Carpenter, S. B. Chadsey, A. T. Drysdale, H. E. Field, B. D. Fuller, W. A. Janssen, H. B. Swan, A. H. Thomas, Walter Wood

Secretary and Treasurer—A. O. Backert

Membership—996 Attendance—"Largest attendance of any convention thus far"

Papers—36 Exhibitors—108

Uniform cost system approved. Committee on specifications for malleable castings appointed. Committee on specifications for steel castings appointed.

1916

CLEVELAND

Sept. 11-16

Meetings—Hotel Statler

Officers elected—President—J. P. Pero

Vice President—Benjamin D. Fuller

Secretary and Treasurer—A. O. Backert

Membership—974 Attendance—1083

Papers—54 Exhibitors—146

American Foundrymen's association is incorporated.

1917

BOSTON

Sept. 24-28

Meetings—Paul Revere hall, Talbot hall

Officers elected—President—Benjamin D. Fuller

Vice President—S. Griswold Flagg III

Secretary and Treasurer—A. O. Backert

Membership—1017 Attendance—1000 Papers—49 Exhibitors—156

Resolutions passed to aid the government during the war.

1918

MILWAUKEE

Oct. 8-11

Meetings—Milwaukee auditorium

Officers elected—President—A. O. Backert

Vice President—W. A. Janssen

Secretary and Treasurer—C. E. Hoyt

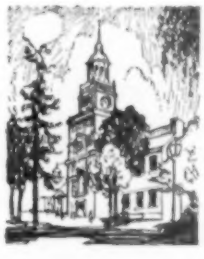
Membership—1072 Attendance—1056 Papers—53 Exhibitors—194

Foundry industry pledges itself to aid the government in the successful completion of the war. Foundry industry called upon to render service by chairman of the U. S. shipping board. Meeting dominated by problems of the industry in the war.

1919

PHILADELPHIA

Sept. 29—Oct. 3



Meetings—Bellevue-Stratford

Officers elected—President—C. S. Koch

Vice President—W. R. Bean

Secretary and Treasurer—C. E. Hoyt

Membership—1103 Attendance—3000

Papers—54 Exhibitors—214

Problems of reconstruction feature meeting. Committee appointed to study sulphur problems

Compact Chronology of the Association

1920
COLUMBUS, O.

Oct. 4-8

Meetings—State Fairgrounds
Officers elected—President—W. R. Bean
Vice President—C. R. Messinger
Secretary and Treasurer—C. E. Hoyt
Membership — 1633 Attendance — 3800
Papers—59 Exhibitors—241
New plan of meetings used. Need for research work stressed. Subject of standardizing patterns for steel foundries placed within the scope of the committee on steel foundry standards. Special committee appointed on pattern standardization. John A. Penton, J. S. Seaman, W. H. McFadden and J. F. Whiting present endowments of $5000 each to society and by the S. Obermayer Co. presented $1000 for awards for meritorious work in the foundry field

1922
ROCHESTER, N. Y.

June 1-9

Meetings—Assembly hall, Municipal Museum building
Officers elected—President—C. R. Messinger
Vice President—G. H. Clamer
Secretary and Treasurer—C. E. Hoyt
Membership — 1456 Attendance — 3672
Papers—56 Exhibitors—178
First international exchange papers presented. Committee appointed to study corrosion of metals. Changes recommended for specifications for by-product coke, pig iron and high test cast iron

1923
CLEVELAND

April 30-May 3

Meetings—Hollenden hotel
Officers elected—President—G. H. Clamer
Vice President—L. W. Olson
Secretary and Treasurer—C. E. Hoyt
Membership — 1560 Attendance — 4000
Papers—63 Exhibitors—214
Committee on refractories and on heat treatment of ferrous castings appointed during the year. American Foundry Equipment Co., gives $1000 for molding sand research. American Foundrymen's association invited to be guests of the Association Technique de Fondrie de France at an International Foundrymen's congress the next year

1924
MILWAUKEE

Oct. 13-16

Meetings—Milwaukee auditorium
Officers elected—President—L. W. Olson
Vice President—A. B. Root, Jr.
Secretary and Treasurer—C. E. Hoyt
Membership — 1622 Attendance — 5000
Papers—62 Exhibitors—218
Committee on nonferrous metals appointed during the year. Sand research and apprentice training feature the program. Committee on international relations appointed during the year. American Foundrymen's association recommends American Society for Testing Materials specifications for chilled cast iron wheels, foundry pig iron, high test gray iron castings and cast iron pipe and special castings. Enrique Touceda awarded John A. Penton medal. John Howe Hall awarded J. H. Whiting medal

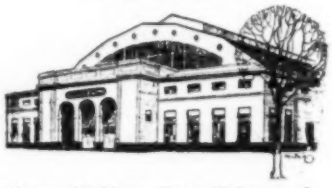
1925
SYRACUSE, N. Y.

Oct. 5-9

Meeting—New York State fair grounds
Officers elected—President—A. B. Root, Jr.
Vice President—S. W. Utley
Executive Secretary and Treasurer—C. E. Hoyt
Technical Secretary—R. E. Kennedy
Membership — 1754 Attendance — 3500
Papers—45 Exhibitors—187
Richard Moldenke awarded Joseph S. Seaman medal. Robert John Anderson awarded William H. McFadden medal. By-laws of the association changed. International test bar for cast iron recommended. First round table meetings held.

1926
DETROIT

Sept. 27-Oct. 1



Meetings—Michigan State Fairgrounds
Officers elected—President—S. W. Utley
Vice President—S. T. Johnston
Executive Secretary and Treasurer—C. E. Hoyt
Technical Secretary—R. E. Kennedy
Membership — 2180 Attendance — 6069
Papers—65 Exhibitors—267
Thomas Turner, England, awarded Joseph S. Seaman medal. John Shaw, England, awarded John A. Penton medal. E. V. Ronceray, France, awarded J. H. Whiting medal. Second international foundrymens congress held.

1927
CHICAGO

June 7-9

Meetings—Edgewater Beach hotel
Officers elected—President—S. W. Utley
Vice President—S. T. Johnston
Executive Secretary and Treasurer—C. E. Hoyt
Technical Secretary—R. E. Kennedy
Membership — 2330 Attendance — 1354
Papers—36 No exhibition held
Committee appointed to study the effect of the use of scrap in the blast furnace on the quality of pig iron. R. A. Bull awarded Joseph S. Seaman medal.

1928
PHILADELPHIA

May 14-18

Meetings—Philadelphia Commercial Museum, Bellevue-Stratford
Officers elected—President—S. T. Johnston
Vice President—Fred Erb
Executive Secretary and Treasurer—C. E. Hoyt
Technical Secretary—R. E. Kennedy
Membership — 2365 Attendance — 7000
Papers—62 Exhibitors—239
First exhibit of castings. First shop operation courses held. Preparations made for 1929 International Foundry Congress. Standard cost systems of the various trade associations approved. Alexander E. Outerbridge awarded William H. McFadden medal.

(*Concluded from Page* 275)

of the gray iron foundry features have been selected for illustration, but the work of the association, by no means has been confined to consideration of problems connected with the manipulation of that metal. Problems connected with steel, malleable iron and the extensive group of nonferrous metals have received extensive recognition.

Apprentice training, refractories, pattern standardization, furnace practice and sand are live factors in the foundry industry and are common to all four of the main branches. For that reason, the association in appointing its committees has endeavored to select men from representative groups and in that manner place itself in a position to act intelligently on any recommendations submitted. Further, a member from each of these special committees is designated a representative on joint committees with other associations engaged in a related line of endeavor. Close working relations are maintained with the United States bureau of standards, the American Society for Testing Materials, National Research council, American Standards association and many others. These features may be checked by a study of the committee personnel given on another page.

Through persistent and aggressive action in recent years the American Foundrymen's association has been responsible largely for the apprentice training movement that has become fairly well established in many of the more prominent foundry centers. From the beginning it has encouraged the movement and has placed the seal of its approval on the effort of individuals, groups of employers and local foundrymen's associations to establish and maintain adequate training

schedules and to encourage eligible young men to take up the study of the foundry business.

Sponsors Apprentice Contests

COMMENCING with the Milwaukee convention in 1924 the association has sponsored a contest between apprentices in molding and patternmaking from centers where a regular training program is in force. It has provided space on its program each year since that time for papers showing what has been done in the way of apprentice training. Also what is proposed to be done along the same line. Without doubt the active interest shown by the parent association has stimulated effort in the various local associations to develop training programs of real merit.

Through its apprentice training committee, men who have been engaged actively in developing and applying specialized courses of study, the association has been in a position to keep close track of the apprentice training movement and to give valuable assistance to individuals or institutions contemplating its introduction.

Harry W. Dietert, Chairman, Sub-Committee on Sand Hardness Tests

Six years ago the American Foundrymen's association first requested the division of simplified practice, department of commerce to undertake the work of simplification covering definite sizes, shapes and types of malleable foundry refractories. The recommendation was adopted at a conference held under the auspices of the division of simplified practice at Washington Nov. 1, 1927, and attended by manufacturers, distributors and consumers of refractories. The recommendation became effective Feb. 1, 1928, subject to annual revision by the interested parties. It is of interest to note that the recommendation known as 79 has been reaffirmed recently for the current year 1929.

This initial step for the benefit of foundry practice in relation to refractories will be of great advantage to manufacturers, distributors and users. Also, it opens the door for further simplification. Necessity for a move of this kind may be inferred from a few of the changes effected. Styles and sizes in tap-out blocks are reduced from 150 to 2. Shapes for side walls, bridge walls, etc., now number 8 instead of 27. Shapes for bungs are reduced from 11 to 5. No change has been made in circle bricks for sacks, but the standards for door opening tile are new.

Following the same line of standardization and simplification, the American Foundrymen's association a few years ago appointed a committee to study pattern standardization. This committee co-operated with committees from the American Malleable Casting association, American Institute of Mining and Metallurgical Engineers, American Society for Testing Materials, Electric Steel Founders Research group, National Association of Pattern Manufacturers, National Association of Purchasing Agents, Foundry Equipment Manufacturers association, Steel Founders Society of America.

A colored chart 11 x 17 inches was prepared by the association and distributed to the membership for guidance and reference. This chart shows a typical wood pattern and corebox with the various surfaces colored in compliance with the newly adopted standard. Key numbers are printed on the various points and attention is directed to them.

Examination of the almost limitless ramifications of the molding and core sand problem has been conducted by the American Foundrymen's association to a major extent over a period of many years. At present and for the past few years this problem has engaged more attention than any other of the many listed in the wide scope of the association activities. Fred Erb, nominated as president of the association for next year, is general chairman of the committee on molding sand research, while Dr. H. Ries, Cornell university, Ithaca, N. Y., is technical director. Some idea of the scope of the work now under way may be inferred from the fact that in addition to an executive committee, the association has appointed a committee on grading, a committee on tests, a subcommittee on rebonding clays, a subcommittee on hardness testing and mold permeability, a subcommittee on core sand tests and a committee on conservation and reclamation.

Dr. H. Ries, Chairman, Committee on Sand Tests: Sub-Committee on Rebonding

One of the most interesting features brought to light as a result of these sand research activities, is that the problem is much more complex than was anticipated. The result of the year's activity by individuals and committees is presented at each convention, but up to the present neither individual nor committee has turned in a final report. They all report progress, but claim that further work is required before the involved and highly tangled skein of many threads is tested out and in condition to be presented in definitely simplified terms.

Nearing Solution

HOWEVER, the work carried on by so many men in so many places and under varying conditions has cleared away most of the overburden of igno-

Drawing Closer

MAJOR interest attaches to the recent reorganization of certain activities of the American Foundrymen's association into four divisions, nonferrous, gray iron, steel and malleable iron. Concentration of these hitherto somewhat scattered activities promises further extension of the excellent work done by the American Foundrymen's association for many years. The general committee on nonferrous foundry practice is to act as a clearing house for the committees whose activities and personnel in most cases will correspond with those previously existent. In this connection it is desired to retain the greatest possible latitude in action to existing committees, at the same time making such additions in personnel and committees as is deemed necessary to attain the objective set forth above. It is felt that the divisional organization in all its branches, including enrollment of all members under proper divisions, will add to the values of the splendid and comprehensive work already accomplished by this well established and progressive organization.

JOHN W. BOLTON
Cincinnati.

rance, indifference and mistaken impressions due to tradition and custom. Work on the actual sand vein or strata now fairly is under way and according to the product already brought to light, the problem soon will cease to be a problem.

Sand Discussed

SOME idea of the extent of the field, also of the attention that has been directed toward it by the American Foundrymen's association may be gathered from the fact that the *Transactions* of the association for 1924 was issued in two volumes. Part 2, a book of 400 pages, was devoted exclusively to the papers and discussions on the subject of foundry sand presented at the Milwaukee convention of the association.

The report of the subcommittee on geological surveys carried in this book is of special interest and value to foundrymen in various sections of the country, since it lists practically all the sand deposits in Alabama, California, Maryland, Michigan, North

R. F. Harrington, Chairman, Committee on Sand Reclamation

Carolina, New Jersey, Pennsylvania, Tennessee and Virginia. Characteristics of sand from these various deposits are shown under: Location, producer, formation, and grade. A supplementary report in tabular form shows the fineness as indicated by screens from 6 to 270 mesh, clay substance, dye absorption, per cent of water, bond strength and permeability.

As a result of its work on molding sand the publicity which has accompanied this work, the American Foundrymen's association has done more than any other agency or factor in breaking down the resistance shown by some foundrymen and the inertia displayed by others to new-fangled methods of judging the qualifications of foundry sands.

The veteran foundryman still prides himself on his ability to form a shrewd estimate of a sand's fitness or unfitness by the simple expedient of squeezing a handful and then breaking the lump apart. The sense of feeling and the evidence of his eyes yields all the necessary information to a man intimately familiar with sand in its actions and reactions over a period of many years.

However, he is willing to admit that it is a species of knowledge, practically impossible of transference to another. Under the methods and standards set up by the American Foundrymen's association any intelligent person can decide on the properties required in molding sand for any given set of conditions. He can choose that sand from a number that may be available and later he can manipulate it to secure maximum and efficient service.

More Work Needed

THE American Foundrymen's association has promoted the study of molding sand for many years and has made great progress during the past five years. Following the Cleveland convention in 1923 a great impetus was given this subject. New testing devices were designed, older methods were revived and improved scientifically. The introduction about this time of artificial bonding elements into the discussion induced sand producers to improve their materials by blending, drying and tempering devices. Also to test and grade the sand at the pits to meet the requirements of the foundrymen as set forth in tentative standards set up by the American Foundrymen's association. When tests are simplified, simple foundry terms used and the foundryman is shown how to control his losses the American Foundrymens association will have completed a great work in advancing the foundry industry.

EUGENE W. SMITH
Chicago

Although not wholly responsible, the work of the association has contributed to a considerable extent to two major developments in the sand situation. Almost without exception, sand producers are prepared to supply sand to meet the tentative standards of the American Foundrymen's association. They are prepared to meet the customer on a common ground and discuss the salient features, grain size, bond, water content, permeability, etc., in terms that convey a definite meaning.

The second development is along the line of synthetic sand, either by combining a bondless new sand with clay, or by renewing the bond in spent sand in the same manner. These features and others are covered by H. B. Hanley, manager, Whitehead Brothers Co., testing laboratory, Rochester, N. Y., in the following comment written in reply to the inquiry: What has the American Foundrymen's association done to foster the study of sand? Comment from other prominent members of the association in answer to this inquiry are presented on other pages. Mr. Hanley writes as follows:

Work of the American Foundrymen's association on molding sands during the past seven years has aroused great interest among foundrymen throughout the country. Important sand sessions have been included in every convention program since 1922. Hundreds of foundrymen have gathered to hear and discuss papers on all phases of this subject. Today, with the vast mass of information available in the *Transactions*, any foundryman can attack his sand problems with reasonable assurance of success. Moral and financial support given to the individual committees by the association has made possible the completion of some long and tedious research work, which has reflected its value directly in a great many foundries where savings have been effected in the cost of operation.

J. L. Wick Jr., Chairman, Sub-Committee on Nonferrous Costs

One of the first tangible results of the work was a bibliography on sands which furnished workers with reference to what had been accomplished. Since that time the association has continued to cite and in many instances publish all important articles on the subject appearing either here or abroad. This has kept the interested worker constantly in touch with progress made by investigators every place.

The geologic survey committee has reported on a vast number of molding sand deposits over a wide area and has supplemented the work with test data on physical properties.

Originates Tests

STANDARD methods of testing foundry sands originated in the association's committee on tests. This work generally is regarded as one of the most valuable contributions made by the association to the foundry industry. Probably it has done more than any other single contribution to advance the study of molding sands. Sands now can be compared in a satisfactory manner with the simple methods

of test procedure that have been developed.

Conservation and reclamation have been investigated thoroughly. The work already has pointed the way to safe and sane methods of conservation, also to important phases of reclamation. In fact, it now is both practical and economical to prepare synthetically a sand to meet any given requirement. During the past five years the number of contributions dealing with this important phase of sand work has completely altered the views of the average foundryman regarding sand reclamation.

A sand grading system has been proposed by the association which furnishes a means of classifying sands from widely different sources. This system should be a decided help to the sand buyer and sand producer. Correct selections may be made on the basis of grain size and clay content. This method of selecting sands will do much to reduce foundry losses.

Association Guides Scientific *Progress*

WHEN the American Foundrymen's association first was formed, there was considerable discussion between the old school foundrymen who advocated selection and mixing of foundry iron by fracture examination, and foundrymen of the modern school who urged the adoption of chemical analyses for that purpose. By precept, example and open discussion at its annual meetings, the old school finally was convinced of the practical value of chemical analyses, and that method was adopted as standard the world over.

Played Important Part

WHILE many revolutionary ideas in the industry were fomenting in the early days, the association played an important part in directing thoughts into the proper channels, by selecting leaders of the various movements to present their theories and convictions for discussion at the annual meetings. This procedure clarified the atmosphere on many points, and resulted in a definite basis from which the various related topics could be investigated further.

One of the prime requisites of any investigation is to have a standard from which to work. For this reason far-seeing members of the American Foundrymen's association established in 1898, a bureau which supplied standard cast-iron drillings which had been analyzed by a number of reputable chemists. In itself this was a rather large undertaking which involved acquiring suitable castings from which the drillings were made, the machine work of making suitable drillings, the mixing whereby uniformity was obtained in the drillings, and the analytical work by several chemists to establish a standard analysis. The bureau of standard drillings was a success from the beginning and was maintained by the association until 1907 when this department was taken over by the government and placed under the jurisdiction of the bureau of standards. Practically every foundry at present maintaining a chemical laboratory depends upon these standard samples of cast-iron drillings.

About the same time that the drillings bureau was established, work was begun on standard methods of chemical analysis. This work was a slow and painstaking occupation that was not wholly completed until 1907. In 1901 a proposed standard specification for gray iron castings was issued and this was followed in 1902 by standard methods for sampling pig iron. Later, in 1916, in co-operation with the American Society for Testing Materials, a standard method of sampling and analyzing pig iron was adopted which with slight changes still is employed in all disputes between buyer and seller, and in many laboratories for routine analytical work.

H. A. Schwartz, Chairman, Committee on Metallography; Malleable Specifications

Much of the incentive for the advances in the metallurgy of cast iron has been supplied at the annual meetings of the association. When the association was formed, selection of pig iron was based upon a visual inspection of a freshly fractured surface of the metal. This method had many good features, but with the development of machine-cast pig iron with its rapid cooling conditions, judging by fracture was useless because the structural changes engendered by rapid cooling made it impossible to differentiate soft from hard pig iron. This was one of the points that gave impetus to the establishment of chemical analyses as the criterion by which pig irons and cast irons made under similar conditions could be compared.

Use of chemical analyses whether supplied by the blast furnace manufacturing the pig iron, or performed in the foundry laboratory, enabled the foundryman to duplicate the results once obtained by employing a certain combination of pig iron and scrap irons. Thus, he was rendered independent of any particular car or brand of iron. The foundryman could specify definitely what kind of iron he desired, and know that his specification would be met within narrow limits.

Progressive foundrymen of an investigating turn of mind found that castings of certain definite analyses were fitted for particular purposes. However, not all foundrymen were so well informed, and it was a moot question whenever a group collected as to what constituted the best combination of silicon, sulphur, manganese, etc., for a casting for a definite use. Another question that attracted attention was the effect of the various elements upon the physical properties of cast iron. A great deal of light was thrown upon these and other related questions in 1910 when at its annual meeting the American Foundrymen's association presented data showing the effect of the elements upon cast iron, and included with the report the analyses of over 100 different types of castings gathered from all parts of the country.

Data Still Used

WHILE changes have been made from early analyses, on the whole, the data put forth at that time have been used with success by foundrymen the world over as a basis for calculating mixtures for various types of castings. These data also have assisted in placing the foundry industry on a firmer foundation, due to the foundrymen in various parts of the country being able to supply castings that are fairly uniform in composition.

Before the formation of the American Foundrymen's association steel,

malleable iron and nonferrous foundrymen were extremely reticent about revealing any arts or practices employed in their fields. While the meth-

John Ploehn, Chairman, Gray Iron Division

ods used in different shops of the same class undoubtedly were quite similar, each foundryman believed that his particular way of doing things was information possessed only by himself. Consequently, he considered it a business secret to which his competitors never should have access. However, with the advent of the association, this attitude was changed. Progressive leaders of the various branches presented their views at the meetings and awakened an interest that has led to placing the steel, malleable iron and nonferrous castings branches upon a high plane.

Steel Advanced

IN THE steel castings field evidence presented has shown that it is much better to make a good steel than to try to correct a poor one. In other words, one of the results of the numerous meetings on steel founding is that the proper place to make steel is in the furnace and not in the ladle. Other features that have engaged the attention of this section of the association have included discussions on open-hearth furnace design and manipulation to obtain good material most efficiently. Melting practice was stressed as was annealing and heat treatment. The latter two practices at one time were haphazard operations but thanks to leadership displayed, they are now standardized. For a long time there was much disagreement between melters on whether steam or air gave the best results in atomizing oil for open-hearth furnace operation. This was settled by a thorough investigation undertaken by the committee on steel foundry standards which showed that only slight differences were evident. In co-operation with other national organizations, the joint committee on the investigation of phosphorus and sulphur in steel has done much valuable work.

The malleable iron castings branch also has benefited to a large degree through discussion of its problems at the meetings of the American Foundrymen's association. As in steel it has been pointed out that it is better to make a good product in the first place than resort to remedies to bolster up a poor material. Metallurgical investigations concerned with the mixing and melting of malleable cast iron have been particularly valuable in that they have resulted in a better product. Results of annealing studies were presented at the meetings which threw much light upon this process and the effect of variations of silicon and carbon was discussed. Thus through information exchanged between members in the form of papers or discussions, the increase in the required tensile strength of malleable cast iron has been changed from 30,000 to 50,000 pounds per square inch. One fallacy that has been exposed was that which was believed for a long time. This held in effect that the skin of malleable cast iron was stronger than the core. While with poorly made material this might exist, the regular run of malleable produced today exhibits no such characteristic. Another advance in technique which was brought before members of the association was the absence of merit in iron oxide as a packing material in annealing.

Why Research?

AT PRESENT two standard specifications exist for cast iron. One is for gray cast iron and the other for high-test cast iron. Since all castings made hardly can be classed under these two heads, why not make only one specification and include in this specification several different grades or other designations of cast iron which will supply castings suitable for a variety of purposes. The lowest grade would have the least strength, and the highest grade the greatest strength. The prices would be regulated by the grade.

Alloy cast irons and steels are produced in larger quantities as time goes on. However, instead of firms stating the nature of the metal, they hide it behind a trade name. Should not this practice be abandoned and the material designated as 1 *per cent nickel cast iron or* 1.50 *per cent manganese steel instead of Nicaron or Stretchit. A few failures of trade-named materials may prove ruinous to its maker, while if they had bona fide technical names with the same reputation as the first mentioned, the failures hardly would be considered anything but accidental.*

Research along castings lines just is beginning to make itself felt. More and more is being done, and with willing hands and funds to assist in advancing research it soon will be on a par with that being conducted on steel and aluminum. When that point is reached the foundry industry will more than hold its own.

Better Brass Castings

WORK done in the nonferrous division of the industry has led to the discarding of obsolete methods and the improvement of nonferrous castings both in appearance, and more important, in physical properties. Discussions by practical and technical men have shown that nonferrous metals and alloys must be melted rapidly and poured at the proper temperatures. Soaking of metal allows it to absorb furnace and other gases which cause defective castings. Improper pouring temperature may or may not result in poor castings, but does reduce the physical properties as has been shown definitely. Much of the guesswork has been removed in producing nonferrous casting mixtures. This has enabled the foundryman to supply castings of the proper composition to fit required purposes. Presentation of investigations and data upon newly developed alloys at the meetings allowed the foundrymen to use the alloys in the castings they could supply, and has resulted in improvements of technique in mixing and melting.

Co-operation of the A. F. A. with other national organizations has established standard specifications for steel, malleable cast iron and nonferrous castings, and has set up definite

John W. Bolton, Chairman, Nonferrous Division

standards for the raw materials which are purchased to manufacture the finished product. Through the committee on heat treatment of ferrous

metals, recommended methods for heat treatment of steel have been adopted.

The American Foundrymen's association does not maintain a research department. However, it has taken an active part in suggestion of problems for research. Furthermore, its funds have been expended in aiding research. For example, in October, 1927, the association published a bibliography of literature on cast iron which contained all references to that material from the year 1870 to the time it was published. This monumental work is invaluable and will prevent duplication of effort, except where such may be done to check the earlier investigators. Recently, the sum of $3000 has been set aside for the investigation of liquid shrinkage in cast iron. This work will be performed at the bureau of standards. Another field wherein the association is active, is in determining the effect of variation of blast furnace operation on the quality of pig iron produced. It is expected that this work will assist in obtaining a better and more uniform quality of pig iron for foundry purposes.

Broad Interests

THE working organization of the A. F. A., exemplified by its various committees, is broad with many ramifications extending into all branches and phases of the foundry industry and related fields. Scientific and technical progress based upon metallurgy, metallography, research, specifications, etc., are promoted by the activities of numerous committees. A graphic chart of the whole organization is presented in another part of this issue as are the various committees and their personnel. To simplify organization control and delegate the problems of greatly diversified character to their specialized fields, a committee of divisional activities which correlates the work was formed. This committee is presided over by N. K. B. Patch, chairman, with six other members; two of whom are from the board of directors of the association. The others are the four chairmen of the divisions on gray iron, steel, malleable iron and nonferrous.

The function of this correlation committee is to make recommendations to the board of directors for appropriations for committee and research activities; to initiate and further committee activities of interest to two or more divisions; to receive and approve reports of divisions and guide in a general way divisional committee activities; to receive and approve reports from general technical committees and guide in a general way such committee activities, and to receive and approve reports from A. F. A. representatives on joint committees of various other interested organizations.

As mentioned previously, there are four divisional committees which cover the gray iron, steel, malleable and nonferrous foundry fields. Since the working organization of each of these divisions is similar, the steel division will be taken as a specific example. The chairman of the steel division is J. Fletcher Harper whose functions are as follows: To further interests of division through committee activities; to call and preside at annual meeting of the combined membership of the divisional committee, or meeting of chairmen of divisional committees; to represent interests of division at meeting of divisional activities correlation committee; to report for division at annual A. F. A. convention, and appoint divisional committee chairmen and members subject to approval of president of the American Foundrymen's association.

A. A. Grubb, Chairman, Committee on Sand Grading

A. F. A. Promotes International *Activities*

ONE of the oldest of the metallurgical arts, the foundry industry, remains always youthful and progressive because its mysteries continually attract men with alert and inquiring minds. Everywhere are casting manufacturers imbued with that healthy dissatisfaction with things as they are which makes for progress. Foundrymen have discovered, too, that progress is not the monopoly of any one country or hemisphere. The metallurgy of iron or steel is the same in Tibet or Erie county, New York.

Scott Mackay, Chairman, Malleable Iron Division

These factors have combined to form the foundation for a great international alliance of foundrymen which finds formal expression again this year in the Third International Foundrymen's congress to be held in London in June.

It is fitting American foundrymen should take a prominent part in this great gathering because it was largely as a result of the initiative of the American Foundrymen's association that casting manufacturers became organized internationally.

Before the war various European foundrymen visited the United States and American casting manufacturers went abroad, being drawn into contact by the common problems of the business in which they were engaged. Thus international relations were established on an informal basis.

The first formal step toward bringing the foundrymen of the world together was taken by the late A. O. Backert, editor, THE FOUNDRY, who visited European countries in 1919 in his official capacity as president of the American Foundrymen's association. Through the force of his great and charming personality Mr. Backert gave real impetus to the idea of setting up some kind of machinery for bringing the foundrymen of America and Europe into contact at regular intervals. The disorganization of Europe during the first few years after the war prevented any definite progress being made until 1923.

Exchange of Papers Suggested

MEANWHILE H. Cole Estep, a member of the American Foundrymen's association and European manager of the Penton Publishing Co., while resident in England in 1920, suggested to the Institute of British Foundrymen

a plan for a formal exchange of papers with the American Foundrymen's association. The proposal was accepted promptly by the British organization. Thus was set up an arrangement which has resulted in the exchange of about 20 papers in the past nine years between the American Foundrymen's association and its European confreres.

The annual exchange of papers is now a part of the regular routine of both the British and American associations. Each year the institute appoints one of its members to contribute a paper to the American Foundrymen's association on some subject of major importance to the British foundry world and at the same time possessing international significance. In turn the American association appoints one of its members to present a paper before the Institute of British Foundrymen. In a number of cases the authors have journeyed across the Atlantic to read their papers in person.

Plan Is Successful

ARRANGEMENTS between the American and British associations have proved so successful that similar exchanges are now taking place between the American and the French and Belgian foundrymen's associations, and between the French and Belgian organizations and the British. Thus has been set up a great ebb and flow of practical, useful information between the foundrymen of the world which has had the effect of quickening technical and business progress everywhere.

The international exchange of papers on foundry practice led naturally to the organization of the International Foundrymen's congresses. The first of these great world gatherings of castings manufacturers was held in Paris in 1923. Its definite organization grew out of a luncheon in Birmingham, England, at the time of the first British foundry equipment exhibition in 1922, which was attended by Oliver Stubbs, F. J. Cook, E. V. Ronceray, Emile Ramas, Vincent Faulkner, Stanley G. Flagg, Jr., Enrique Touceda and H. Cole Estep.

E. R. Young, Chairman, Sub-Committee on Core Sand Tests

A delegation of about fifty American foundrymen attended the initial International congress in Paris in 1923. In 1926 the second congress was held in Detroit under the auspices of the American Foundrymen's association. It was preceded and followed by tours in the course of which the European guests were greeted and entertained by the foundrymen of New York, Philadelphia, Buffalo, Chicago, Cleveland and Pittsburgh.

Out of the Second International Foundrymen's congress in Detroit grew the organization of the Foundrymen's International committee, of which S. T. Johnston, president of the American Foundrymen's association, will be chairman this year. This committee consists of delegates appointed by British, French, Belgian, German, Czechoslovak, Dutch, Italian, Luxemburg, Spanish and American foundrymen's organizations. The American members, in addition to Mr. Johnston, are Vincent Delport and H. Cole Estep.

To the Foundrymen's International committee the various national associations have delegated the organization and conduct of the International Foundrymen's congresses. It has been agreed that the International congresses shall be confined to Great Britain, France, Germany and the United States, at intervals of three years. The schedule for the next several years is as follows: 1929, London, England; 1932, Dusseldorf, Germany; 1935, Paris, France; 1938, United States.

The American Foundrymen's association handles its international activities through its committee on international relations, the membership of which now includes, L. L. Anthes, G. H. Clamer, Stanley G. Flagg, Jr., S. W. Utley, Vincent Delport, Verne E. Minich, S. T. Johnston, Fred Erb, C. E. Hoyt and H. Cole Estep, chairman.

For the Peace of the World

BESIDES promoting the progress of their own industry, the foundrymen of the various nations, through their close international contact, are making a definite and valuable contribution to the maintenance of world peace.

If this be idealism, let it stand. Surely there could be no more worthy object for which a group of business men, engineers and scientists could band together. What the foundrymen of the world are trying to do through their international activities is to make a real contribution to the progress of the human race.

Exhibits Further Mechanization *of Industry*

DURING the past 30 years remarkable progress has been made in the industry devoted to casting metals. Year by year, as the demands for better engineering materials have increased with the advancement of the great mechanical era sweeping the entire world, the foundry industry has developed the quality of its product to meet the needs of consumers. While numerous factors have aided materially, the development and perfection of mechanical equipment has been of outstanding importance, since it has enabled foundrymen to produce high quality products at a price to compete successfully with other engineering materials serving the same field.

Although some mechanical equipment was used in the leading foundries of the country in the latter part of the nineteenth century, the machines were crude in comparison with the highly specialized and precise equipment which identifies the modern foundry. Contrasting the old time devices with those employed at the present time, it seems rmearkable that the heavy and complicated castings required for some of the machines produced at that time, could have been made. Undoubtedly, the tasks of the modern foundryman have been made easier through the numerous developments of the past thirty years in foundry equipment. The industry was just beginning to recognize the value of foundry equipment in the nineties. The cupola had become the melting medium and several types of blowers had been developed to supply the necessary blast of air. Molding machines of simple construction were used in some plants to increase the output of the molder, but hand molding, either on the floor or bench, predominated. Handling materials was recognized as a prob-

lem and overhead cranes, jib cranes and overhead track systems could be found in numerous plants, but the efficiency of that type of equipment fell far short of the various units now used for that purpose. While practically all sand was tempered by hand, machines had been introduced to accomplish that work with greater speed and accuracy. The necessity for core baking units had led to the development of special ovens which could be purchased from several manufacturers. In the cleaning room, tumbling mills of simple design, flexible shaft equipment and small stand grinders were used. Sandblast equipment had been introduced, but prejudice against the process had not at that time been overcome by the manufacturers. Electric current although known as a source of power, was just gaining headway, and consequently many of the units still were driven by steam engines through shafting. The introduction of molding machines and sandblast equipment necessitated some source for compressed air and therefore compressors were being considered as foundry equipment.

Aids Mechanical Development

THE American Foundrymen's association has been one of the important factors contributing to the progress of the foundry industry during the past 33 years. Several activities of the association have aided materially in the development and perfection of various types of equipment to meet the needs of the foundry industry. Early in the life of the organization those in charge of arranging the technical programs realized the importance of the problems connected with the application of foundry equipment to the needs of the industry, and time was allotted for several papers on pertinent questions. At the Philadelphia convention in 1896, when the association was founded, four of the 12 papers presented dealt with some phase of the equipment problem. The subjects of the four papers were as follows: "Foundry Cranes;" "Air Compressors Used in the Foundry;" "The Sandblast for Cleaning Castings;" and "Molding Machines and Their Application." The presentation of papers on equipment has continued at each of the 32 conventions since the initial gathering in Philadelphia and in the main the number of papers devoted to that phase of foundry operations has been increased.

However, the greatest contribution of the American Foundrymen's association toward the increased use of the most modern type of foundry equipment has been through the exhibition feature. These shows have presented an opportunity for manufacturers to show the latest developments in foundry equipment and supplies. The evolution of the exhibition idea is interesting, in that the management of the enterprise passed through several groups before the show was established as a function of the American Foundrymen's association. No thought was given to an exhibition at the first convention, although THE FOUNDRY may claim the distinction of being the first exhibitor, since a special room was maintained in the Manufacturers club, Philadelphia, in 1896, where friends of the paper were welcomed. The following year, the association meeting was held in Harmonie Hall, Detroit, where the first attempt was made to hold an organized exhibit.

The committee in charge of the equipment exhibition provided space for a number of booths in the auditorium of Harmonie Hall and 24 equipment and supply manufacturers availed themselves of the opportunity to show their wares. A number of the firms represented at the first show still are in business, although the majority long since have passed beyond the horizon of foundry affairs. Since the companies represented at Detroit were pioneers in the exhibition of foundry equipment in conjunction with the convention of the American Foundrymen's association, the individual names are of interest. Those exhibiting were as follows: Lyne Abrianse; E. M. Ayres; Brown & Sharpe Mfg. Co.; Bryan Co.; Buchel Co.; Burrs' Damascus Works; Detroit Emery Wheel Co.; Fanner Mfg. Co.; W. J. Keep; Keystone Coal & Coke Co.; Leland & Faulconer Mfg. Co.; J. S. McCormick Co.; Millett Core Oven Co.; Mississippi Glass Co.; Henry E. Pridmore; P. H. & F. M. Roots Co.; J. D. Smith Foundry Supply Co.; F. B. Stevens; Chas. A. Strelinger & Co.; Tabor Mfg. Co.; Robert J. Taylor & Son; Whitehouse & Strong; Whiting Foundry Equipment Co.; and Wilbraham Baker Blower Co.

R. S. MacPherran, Chairman, Sub-Committee on Blast Furnace Relation

Although leaders in the association movement predicted that the exhibition feature would prove a permanent addition to the annual gathering due to the benefits derived from the Detroit show, it was not until the Cleveland convention in 1906 that an organized exhibition of size again was held. From 1898 until the New York convention in 1905, the number of exhibits maintained in the hotel corridors and rooms continued to grow, and at the latter meeting some space was reserved in the basement of the Murray Hill hotel.

By that time, manufacturers of equipment and foundrymen agreed that the exhibition was a valuable feature of the convention program and one which should be continued for the good of the industry. After considerable thought had been given to the subject of an organized exhibit for the Cleveland convention in 1906, approximately 25 manufacturers and dealers in equipment and supplies agreed to underwrite an exhibit to be held in conjunction with that meeting. The Armory, a large building located across the street from the present Public hall where the 1923 convention was held, was rented for the purpose and about 60 exhibits were maintained around the outer edge of the room, while the sessions were held in the center of the building. It is interesting to note that the exhibits were closed during the technical sessions.

Form Association

AS AN outgrowth of the Cleveland show, the Foundry Supply association was formed for the purpose of assisting the American Foundrymen's association in holding the conventions and when advisable to hold exhibits of foundry equipment and supplies. S. T. Johnston, now president of the American Foundrymen's association, was made first president of the new association and H. M. Lane was elected secretary. That organization held exhibits at Philadelphia in 1907 and in Toronto in 1908, under the direction of Mr. Lane. Shortly before the Cincinnati convention in 1909, Mr. Lane resigned and C. E. Hoyt, now executive secretary of the American Foundrymen's association, was made secretary of the Foundry & Manufacturers Supplies association, the name that had been adopted by the Foundry Supply association at the Toronto convention so that all classes of exhibitors were included. An exhibition was held at Detroit in 1910.

After the Detroit convention, the Foundry & Machine Exhibition Co. was formed to handle the exhibits,

the Foundry & Manufacturers Supplies association being discontinued. From 1911 to 1915 the exhibition company held the following exhibits: Pittsburgh in 1911, Buffalo in 1912, Chicago in 1913 and 1914, and Atlantic City in 1915. Following the Atlantic convention and exhibition, the American Foundrymen's association took over the handling of exhibits and C. E. Hoyt was placed in charge of that activity under the direction of a special exhibit committee. Since that time conventions and exhibitions have been held as follows: Cleveland, 1916; Boston, 1917; Milwaukee, 1918; Philadelphia, 1919; Columbus, 1920; Rochester, 1922; Cleveland, 1923; Milwaukee, 1924; Syracuse, 1925; Detroit, 1926; Philadelphia, 1928.

It is rather interesting to note that the exhibition feature has operated in five-year cycles since the Cleveland exhibition in 1906. The Foundry Supply Co. was in existence five years, when the exhibition feature was taken over by the Foundry & Machine Exhibit Co. After five years under that company, the American Foundrymen's association undertook the management. Exhibits were held for five years, but the show was omitted the following year since no convention was held. Another five-year period extended from 1922 to 1926, but in 1927, no exhibition was held with the Chicago meeting.

Today, the convention and exhibit of the American Foundrymen's association is recognized as one of the vital factors affecting progress in the foundry industry. Representatives from all sections of the country journey to the convention city to hear the various papers presented and to visit the exhibition. By comparing the total attendance at Chicago, in 1927 when no exhibition was held, with Detroit in 1926 or Philadelphia in 1928, it may be concluded that a great number of those attending the convention go for the purpose of becoming better acquainted with the mechanical developments which have taken place in the industry.

Foundryman Is Interested

SINCE the Detroit convention in 1926, considerable discussion has been devoted to the question of holding annual exhibitions of equipment. Several ideas have been advanced by various individuals and groups, but no definite policy has been made public regarding the time interval between exhibitions. While on first consideration, it would seem that the solution of the problem rests entirely with the association management and the exhibitors, it should be remembered that, in the last analysis, the foundry industry will be the group most affected by holding or omitting exhibitions of foundry equipment. For that reason, it might be best to secure an expression from the foundry industry of North America before making any decision.

From the viewpoint of the manufacturer of equipment, great benefits may be derived from the exhibition feature. Much of the progress of the foundry industry since the dawn of the twentieth century has resulted from the improvements and developments which have been made in equipment. The perfection of existing equipment and the invention of entirely new machines to lighten the burden of the foundryman have resulted almost entirely from a willingness on the part of the equipment manufacturer to invest both time and money in improvements. Perhaps nine times out of ten, progress in foundry equipment has resulted from study and research by the equipment manufacturer rather than from the effort of any individual or group in the foundry industry.

C. J. Freund, Chairman, Committee on Apprentice Training

The manufacturer has three avenues by which he may carry the information regarding new developments to the consumers in his field, namely salesmen or other direct representation, advertising pages in publications reaching the buyers of the product, and exhibitions attended by consumers of the product. These three factors are so interconnected that no one should be slighted in the sales campaign of the equipment manufacturer. The builder of foundry equipment would do well to study the results which are being obtained in other industries through the medium of exhibitions.

Perhaps the most familiar example is found in the automobile industry, where the annual shows held in the larger cities of the country have become the opening wedge in the sales campaigns which yearly carry the automobile manufacturer to greater sales and production heights. As in practically all types of mechanical equipment, each year sees improvements made in the design of the automobile. These changes first are introduced at the annual shows, and so great has become the popular interest in these events, that hundreds of thousands of prospective buyers pay for the privilege of seeing what the manufacturer has to offer.

Equipment Must Advance

FOUNDRY equipment manufacturers may feel that there is no connection between the automotive field and their industry, since foundry equipment is not subjected to yearly changes in design. In the main this may be true, but foundry equipment cannot be static. The individual visiting each American Foundrymen's association show realizes that radical changes are constantly being made, and that at each exhibition, a majority of those maintaining displays have something entirely new or developments in previously existing equipment which are worthy of attention. Due to size, weight, etc., of the new equipment, the foundry equipment exhibition offers practically the only means of bringing the equipment and a large group of foundrymen together.

Obsolescence is another factor which has a direct bearing upon the exhibition problem. The foundry industry today is faced with the problem common to every industry of replacing antiquated equipment with modern machinery. Keen competition from without the industry, in addition to competition from other casting producers demands the manufacture of quality castings at the lowest possible price. Competition of this kind cannot be met with equipment less efficient than that used by other foundrymen making a similar class of work. One of the important problems of the equipment manufacturer is to acquaint the foundrymen with the evils of inefficient equipment and to present the latest machines to accomplish the same work more efficiently. Undoubtedly, the exhibition of foundry equipment held in conjunction with the convention of the American Foundrymen's association has been an important factor in accomplishing this work in the past, and future shows should prove even more fruitful.

The 21 exhibitions of foundry equipment held in connection with the American Foundrymen's association convention have been a potent factor in placing the foundry industry on a par with other lines of industrial activity. While the benefits have been enormous, the possibilities for future service are even greater. Mechanization has become the goal of every industrial activity.

Exhibits to Show

Recent Developments

In Foundry Equipment

THE exhibition of foundry equipment and supplies to be held in the Stevens hotel, Chicago, April 8 to 11, in connection with the thirty-third annual convention of the American Foundrymen's association, promises many interesting features. While the amount of floor space available for exhibition purposes is smaller than at several of the recent conventions, in the neighborhood of 150 leading manufacturers of supplies and equipment have secured space to demonstrate the application of their product to the large group of American foundrymen who will attend the convention.

At many of the booths, recently developed equipment will be displayed for the first time. Reports from many of the exhibitors indicate that great care is being exercised in the selection of the materials which will be shown, and that in most instances, special emphasis is being placed on developments and improvements which have been made since the exhibition in Philadelphia. Undoubtedly, every progressive foundryman will find considerable of interest at the 1929 convention.

For the benefit of those wishing more information regarding the exhibits, THE FOUNDRY has prepared descriptions of the individual exhibits and lists of company representatives at Chicago.

A

ABRASIVE CO., Philadelphia — Bakelite bonded, high speed grinding wheels used for grinding steel and iron castings, another type of grinding wheel for cast iron and unannealed malleable iron, a varied assortment of smaller grinding wheels for cleaning castings, and rubbing bricks will feature the display of this company. Special photographs will show high speed grinding machines in operation. The company will be represented by W. B. Ilko, S. M. Hershey, J. P. Murphy, J. H. Johnson, and G. W. Collman.

ABRASIVE INDUSTRY, Cleveland—The booth of this company will be fitted up with a rest room where those attending the convention are invited to make their headquarters. The representatives will be H. Cole Estep, J. D. Pease, G. B. Howarth, A. L. Klingeman, S. H. Jasper and F. B. Pletcher.

ACME OIL CORP., Chicago—This company will show samples of core oils. Representatives will be H. Schlosstein and George M. O'Connor Jr.

ADAMS CO., Dubuque, Ia.—Stationary and portable jolt squeeze molding machines, snap flasks, slip flasks, steel jackets, steel bands, and vibrators will be displayed by this company. Representatives will be William J. Spensley and John A. Cameron.

ADVANCE MILLING CO., Chicago—This company will feature samples of its core binder. The display will be in charge of D. T. McGrory.

AIR REDUCTION SALES CO., New York—This company will exhibit tanks of oxygen, acetylene and carbide and apparatus for oxy-acetylene welding and cutting. Representatives will be J. S. Strate, M. M. Weist, S. H. Shaykin, Paul Burns, H. R. Salisbury, T. M. Hamer, F. B. Loucks, Walter Love and G. Van Alstyne.

AJAX ELECTROTHERMIC CORP., Trenton, N. J.—This company will show the principles and operation of the high frequency induction furnace with the aid of motion pictures and will exhibit a wooden model of a 300-pound coreless induction furnace suitable for melting steel and nonferrous metals. Representatives will be G. H. Clamer, Dudley Wilcox and R. N. Blakeslee Jr.

AJAX METAL CO., Philadelphia—This company will show bronze and brass ingot metals, white metals, castings, and moving pictures and charts of an induction type electric furnace. Representatives will be G. H. Clamer, W. J. Coane, John G. Miller, Zeno D. Barns, Frank M. Willeson, R. J. Kelley, William Adams and Henry Geiseke.

ALLOYS & PRODUCTS, INC., Bronx, N. Y.—A variety of metal alloys will feature this display. The company will be represented by Henry Hecht, Frank J. McCaul, Charles J. Harney, Edward E. Berliner and Gilbert T. Mason.

ALBANY SAND & SUPPLY CO., N. Y.—Numerous samples of molding sand graded according to American Foundrymen's association standard specifications will be shown by this company. Representatives will be Lawrence Murray and M. J. Slater.

AMERICAN BRAKE SHOE & FOUNDRY CO., Chicago—Special types of annealing pots, plates and stools will be shown by this company. Representatives will be C. P. Wright, V. G. Bates and W. S. Cumming.

AMERICAN ENGINEERING CO., Philadelphia—Various types of hoists will feature the display of this company. Representatives are J. G. Worker, J. S. Neisser, G. L. Drake, G. H. James, H. C. Sturman, E. V. Brown and C. W. Schroeder.

AMERICAN FOUNDRY EQUIPMENT CO., Mishawaka, Ind.—A combination machine for tumbling and sandblasting castings, aluminum flasks, steel pouring jackets and miscellaneous parts will be shown by this company. Other products which it manufactures will be shown by moving pictures and photographs. The representatives will be Verne E. Minich, John S. Sammons, Hutton H. Haley, O. A. Pfaff, Ralph J. Hutchinson, C. B. Schneible, John D. Alexander, James Rigby, Jerome E. Sweet, F. G. Schultz, E. J. Turnbull, Charles L. Benham, L. B. Kerr, and A. H. Freeman.

AMERICAN VENT WAX CO., Lockport, N. Y.—This exhibit will consist of numerous spools of vent wax ranging in size from 1/32 to 5/8-inch in diameter. Cores in which that type of vent wax has been used also will be shown. N. L. Nankey will represent the company.

ARCADE MFG. CO., Freeport, Ill.—A heavy duty molding machine, a jolt rollover core machine and a jolt squeezer will be shown by this company. The representatives will be L. L. Munn, B. C. Trueblood, Mentor Wheat, V. S. Firestone, August Christen, R. E. Turnbull, Herman Kasten and G. D. Wolfley.

AUSTIN CO., Cleveland—This exhibit will consist of photographs, plans, specifications showing methods applied to the development and construction of modern foundry buildings. The exhibit will be in charge of Harry E. Stitt, G. A. Bryant, Albert S. Low, N. L. Palmer, C. G. Palmer, L. R. Campbell and P. C. McCabe.

AUTOMATIC TRANSPORTATION CO., INC., Buffalo—Storage battery low and high lift elevating platform trucks will be featured by this company. G. A. Freeman, F. H. Tinsley, F. G. Dunbar, F. R. Dunbar and R. J. Mulholland will be in charge.

AXMANN SAND-THROWING MACHINE CO., Cleveland—This company will exhibit a sand-throwing machine for blending, mixing, aer-

ating and conditioning foundry sand as well as a unit equipped with a vibrating screen feeding hopper and numerous photographs of installation. The representatives will be S. L. Dryfoos, E. J. Welter, and M. A. Beltaire, Jr.

B

C. O. BARTLETT & SNOW CO., Cleveland—Photographs and motion pictures of sand handling and mold conveying installations will be on display at the booth of this company. Representatives will be H. S. Hersey, H. L. McKinnon, M. E. First, H. C. Orr, W. J. Freuchtel, S. G. Artingstall, Jr. and J. E. Bates.

H. L. BAUMGARDNER CORP., Chicago—This company will exhibit tapered draw flasks, cast iron and aluminum jackets and core oils. The representatives will be H. L. Baumgardner, J. B. Skelly, B. Y. Leslie, J. M. Morrow, J. Karlovetz and J. Hines.

BAUSCH & LOMB OPTICAL CO., Rochester, N. Y.—Optical and scientific instruments such as photomicrographic cameras, microscopes, etc. will be shown by this company.

BEARDSLEY & PIPER CO., Chicago—Photographs of sand slinging machines installed in foundries will feature the display of this company. Representatives will be E. O. Beardsley, W. F. Piper, N. W. Stratford, W. E. Naylor, George Furman, Charles Suess, A. L. Miller, Robert R. Snow, H. Lind, H. G. Schlichter, Peter Stefan, E. L. Mitchell, Frank J. Opatrny, A. Magnuson and E. O'Connor.

BETHLEHEM STEEL CO., Bethlehem, Pa.—This company will show typical fractures of pig iron and samples of castings made with mixtures which include special iron. Company representatives in attendance will be Robert MacDonald, F. E. Fisher and A. D. Smith.

BLAW-KNOX CO., Pittsburgh—A clamshell bucket, small samples of steel grating, steel reinforcing material for floors, and enlarged photographs of steel buildings will be shown by this company. The representatives will be W. C. Cochrane, D. C. Grove and G. Schirmer.

BRITISH ALUMINIUM CO. LTD., New York—Aluminum ingot and aluminum alloys for foundry work will be shown at the booth of this company under the direction of Ernest V. Pannell.

BUCKEYE PORTABLE TOOL CO., Dayton, O.—Portable pneumatic grinders and other tools will be featured by this company. Representatives will be W. W. Price, H. W. Leighton and H. O. Gummere.

C

CAMPBELL-HAUSFELD CO., Harrison, O.—Melting furnaces using gas or oil fuel and equipped with direct connected electric-driven blower and oil pump will be shown by this company. Tilting type crucible and stationary crucible furnaces for brass, bronze and aluminum also will be shown. The representatives will be J. S. Armour, C. E. Haddock, C. C. Simpson and O. H. Luebbing.

CARBORUNDUM CO., Niagara Falls, N. Y.—This company will show a line of snagging wheels for the foundry industry including a specially bonded high speed wheel. The representatives will be S. F. Courter, G. W. Chormann, B. H. Work, F. R. Gridley, R. C. Bradbury, L. F. Ells, H. E. Kerwin, C. J. Steuber and J. M. Engman.

CHAIN BELT CO., Milwaukee—Photographs of installation of foundry equipment including sand handling and conditioning units, mold and casting conveyors, etc., will be shown by this company. Representatives will be C. R. Messinger, J. C. Merwin, W. B. Marshall, F. A. Pampel, E. M. Handley, R. T. Steindorf and F. S. Bosworth.

FRANK D. CHASE, INC., Chicago—Plans and layouts of new and remodeled foundries will be shown by this company. Representatives will be Frank D. Chase, M. L. Pereira, C. R. Cady and L. J. Chase.

CHICAGO MFG. & DISTRIBUTING CO., Chicago—A line of foundry supplies will be shown by W. F. Schlefflen and R. J. McKee.

CHISHOLM-MOORE HOIST CORP., Tonawanda, N. Y.—Cupola charging equipment, chain hoists and electric hoists will feature the display of this company. The representatives will be P. W. Shaw and W. H. Morgan.

CLARK TRUCTRACTOR CO., Battle Creek, Mich.—A 3-ton lift truck and a low auto dump truck with a 30 cubic foot body will be shown by R. J. Burrowes, Ezra W. Clark, Walter Nochumson and R. F. Sutton.

CLEVELAND VIBRATOR CO., Cleveland—Plate vibrators, machine vibrators and shake-out vibrators as well as a display of valves and accessories will feature the exhibit of this company. Representatives will be J. J. Becker, J. B. Benyak, K. G. Becker.

CLIPPER BELT LACER CO., Grand Rapids, Mich.—This company will exhibit belt lacers, cutters, fasteners and pins. A special speed type lacer also will be shown. The display will be in charge of George E. Farmer and Fred E. Best.

CORN PRODUCTS REFINING CO., New York—Core binders of both the dry and green bond types will be shown. The company will be represented by S. B. Krantz, R. H. DeWaters, H. A. Crown, F. G. Faller Jr., A. H. Kreischer, P. J. Dapkus, Wm. T. Maguire, J. M. Millikan and H. C. Knubbe.

D

DAILY METAL TRADE, Cleveland—The booth of this company will be fitted up as a restroom where those attending the convention are invited to make their headquarters. The representatives will be J. D. Pease, L. C. Pelott, S. H. Jasper, A. L. Klingeman, F. B. Pletcher and J. J. Kerr.

DAYTON PNEUMATIC TOOL CORP., Dayton, O.—Pneumatic chippers, riveters, sand and bench rammers, and a complete line of hose couplings and chisel blanks will be shown by this company. W. B. George and E. C. George will be in charge.

DEISTER CONCENTRATOR CO., Fort Wayne, Ind.—This company will show a foundry residue reclamation plant in operation and a special type of foundry screen. The company will be represented by N. Rhume, C. W. Fugate and Raymond Green.

HARRY W. DIETERT, Detroit—A complete sand control laboratory meeting American Foundrymen's association specifications will be in operation at this booth. The equipment will consist of balance and weights for weighing samples, sand rammer, permeability machine, strength test machine, a compression instrument for determining compressive strength to molding sands, a drying oven, a rapid sand agitator for fineness test, a bond meter for testing the bond strength of clays, binders and other materials, a moisture tester, a moisture indicator, automatic shut-off water meter and mold hardness tester. The display will be in charge of Harry W. Dietert, Jack Goldstein and H. A. Davison.

WM. DEMMLER & BROS., Kewanee, Ill.—Core blowing machine will feature the display of this company. The representatives will be H. L. Demmler, J. N. Demmler, F. A. Demmler and Charles Eshelman.

DETROIT ELECTRIC FURNACE CO., Detroit, Mich.—A 100 kilowatt electric furnace including transformer and control equipment will be shown in operation by this company. Brass, bronze and the gray iron castings made from metal melted in an electric furnace manufactured by this company also will be shown. Ed. L. Crosby, A. E. Rhoads, L. C. Wilson, C. A. Hamann, R. R. Stokes, G. R. Jackson, and L. T. Crosby will represent the company.

DIAMOND CLAMP & FLASK CO., Richmond, Ind.—Wood snap flasks, steel jackets, steel bands, steel bottom plates, steel core plates, wood wedges, wood core boxes and snap flask fittings will feature the display of this company. F. J. Gartside and E. A. Kinley will be in charge of the booth.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.—Samples of graphite crucibles, stoppers, nozzles and clay refractories will be shown at this booth. The representatives will be A. L. Haasis, F. R. Brandon, R. F. Leonard, J. E. Schultz, R. R. Belleville, L. G. Masner and J. E. Thomas.

E

EASTERN CLAY PRODUCTS, INC., Buffalo—This company will exhibit samples of various bonds and a number of castings in which sand bonded with these materials was used. In addition the company will operate a small laboratory size sand mixer to show the possibilities of producing suitable molding sand by the addition of bond to various types of sands. The representatives will be S. H. Cleland, R. L. Cleland, E. B. Norris, N. J. Dunbeck, G. H. Barnes, C. B. Schureman, R. S. Holland, R. C. Halliday, E. R. Williams.

D. A. EBINGER SANITARY MFG. CO., Columbus, O.—A line of industrial wash room equipment will be shown by this company. The representatives will be R. S. McMahon, R. H. Evans and A. E. Smith.

ELECTRIC STORAGE BATTERY CO., Philadelphia—This company will exhibit batteries for propelling electric industrial trucks and tractors.

ELECTRO-CHEMICAL PATTERN & MFG. CO., Detroit—Electro deposited patterns and core boxes, a line of split pattern, a variety of castings made with these patterns, cope and drag plates, and equipment for special type molding will be exhibited by this company. A. K. Laukel, John Laukel and Samuel Weisman will be in charge.

ELECTRO REFRACTORIES CORP., Buffalo—Crucibles and silicon carbide refractories will be shown by this company. The representatives will be L. U. Milward, T. W. Campbell and D. B. Milward.

F

FANNER MFG. CO., Cleveland—Foundry chaplets and tumbling mill stars will feature the display of this company. Representatives will be J. R. Raible, C. G. Raible, C. E. Ireland, P. D. McDonnell, F. W. Beck and E. Durant.

FEDERAL FOUNDRY SUPPLY CO., Cleveland—This company will show foundry sand testing equipment for the laboratory, core binders and other foundry supplies. The representatives will be T. J. Brown, Otto E. Peterson, Walter Gerlinger, George A. Fuller and L. H. Heyl.

THE FOUNDRY, Cleveland—The booth of this company will be fitted up as a rest room where those attending at the convention are invited to make their headquarters. The representatives will be H. Cole Estep, J. D. Pease, Dan M. Avey, Frank G. Steinebach, Pat Dwyer, Edwin Bremer, F. B. Pletcher, G. B. Howarth, S. H. Jasper, L. C. Pelott, A. L. Klingemann and C. A. Wardley.

FOUNDRY EQUIPMENT CO., Cleveland—This company will show photographs of installations of core and mold ovens including the rolling drawer, portable rack, car, shelf and

conveyor types. C. A. Barnett, O. D. Conover, M. A. Beltaire, Jr., and E. J. Welter will represent the company.

FOUNDRY SUPPLIES MFG. CO., Chicago—This company will show foundry supplies.

G

GENERAL ELECTRIC CO., Schenectady, N. Y.—This company will exhibit welding equipment, motors and control equipment and cupola blowing equipment equipped with an automatic device to insure constant weight of air in the cupola.

GIRARD SMELTING & REFINING CO., Philadelphia—Rough and finished castings, ingot metals, solder, babbitt, lead and other white metals will be shown by Maurice Sall, Charles E. Fellows and Albert Katz.

GLOBE STEEL ABRASIVE CO., Mansfield, O.—This company will show samples of cornered steel grit and chilled shot as well as specimens of castings cleaned with these metal abrasives. C. H. McConnell will represent the company.

GREAT LAKES FOUNDRY SAND CO., Detroit—Molding sand, core sand, silica sand, sandblast sand, fire clay, limestone, mica schist, and sand testing equipment will be exhibited by this company. Wm. J. Muhlitner, J. D. Cronenweth, J. G. Mendenhall, N. I. McArthur, H. P. Mackinnon, P. E. Giberson, Edw. B. J. Carroll and M. B. Giberson, Sr. will be in charge of the exhibit.

GREAT WESTERN MFG. CO., Leavenworth, Kan.—Gyratory foundry riddles, including a laboratory riddle for testing the fineness of foundry sand will be displayed. P. L. Wilson will be in charge.

H

HAYWARD CO., New York—An electric motor clam shell bucket will feature the display of this company. Representatives will be H. C. Ryder, H. S. Atkinson and R. W. Hawkins.

HERMAN PNEUMATIC MACHINE CO., Pittsburgh—This company will show a new jarr-rollover and pattern drawing machine and a jarr stripping plate machine for work of a smaller nature. Representatives will be Thomas Kaveny, A. G. Doyle, Richard Harris, Robert F. Ringle, I. J. Oesterling, Thomas Kaveny, Jr., C. S. McMath, W. W. Hughes, Robert M. Porteous, L. L. Johnston and Joseph Gibson.

HOOSIER MOULDING SAND CO., Indianapolis—Samples of molding sand will be shown by this company. Representatives will be B. E. Neal and H. A. LeFeber.

HYNSON, WESTCOTT & DUNNING, Baltimore—This company will exhibit an antiseptic for first aid and dressing station use. L. C. Shepherd, Nathaniel Nicolai, Harold W. Beatty, J. T. Moffit and Archimedes Serafini will be in charge of the booth.

I

ILLINOIS CLAY PRODUCTS CO., Joliet, Ill.—Fire clay and fire clay flour suitable for foundry use and for rebonding molding sand will feature the display of this company. The representatives will be Otis L. Jones, A. S. Nichols, L. E. Everett and H. L. Blackwell.

ILLINOIS TESTING LABORATORIES, INC., Chicago—This company will show a low temperature pyrometer. Representatives will be J. A. Obermaier, Martin J. Rauscher and Emil D. Brayne.

INDIANA CONSUMERS GAS & BY-PRODUCTS CO., Terre Haute, Ind.—Samples of by-product foundry coke will be shown. The representatives will be Leon Stern, John F. Molony, Lloyd E. Davis and Lewis D. McClaren.

INDUSTRIAL MINERALS CO., Columbus—This company will show samples of its sandblast sand, steel abrasives, iron and steel molding sand, silica wash and core sand. The company will be represented by Willis G. Edwards and H. N. Rose.

INTERNATIONAL MOLDING MACHINE CO., Chicago—This company will show molding and core making machines and will be represented by Edward A. Pridmore, Harold N. Pridmore, Lawrence D. Pridmore, W. W. Miller, Carl Levahn, E. G. Borgnis, Hugh Gallagher, N. J. Monahan, W. J. Rowley, Luke S. Shannon, T. L. Concklin, W. J. Briggs, Clarence Becklin, Carl Johnson and James Hrdina.

INTERNATIONAL NICKEL CO. INC., New York—Members of the development and research staff of this company will be in attendance to discuss the production of nickel alloyed castings. The company will be represented by T. H. Wickenden, D. M. Houston, F. E. Coyle, J. S. Vanick, F. S. Jordan and E. J. Bothwell.

IRON TRADE REVIEW, Cleveland—The booth of this company will be fitted up as a restroom where those attending the convention are invited to make their headquarters. The representatives will be H. Cole Estep, J. D. Pease, E. L. Shaner, F. B. Pletcher, Edwin Bremer, L. C. Pelott, and C. A. Wardley.

J

W. A. JONES FOUNDRY & MACHINE CO., Chicago—This company will show samples of its line of speed reducers. Representatives will be Joseph A. Marland, W. S. LaSalle and James Porter.

K

CHARLES C. KAWIN CO., Chicago—This company will distribute information regarding its foundry advisory service and analysis work. Representatives will be Charles C. Kawin, John Tissing, W. H. Griner, Charles V. Edwards and W. S. Miller.

KEENER SAND & CLAY CO., Columbus, O.—This company will show core and sandblast sands, fire brick and rebonding clay. Representatives will be Claud P. Helmick and Emery M. Durstine.

SPENCER KELLOGG & SONS SALES CORP., Buffalo—This company will display linseed base core oils, interesting examples of cores made from these oils and some finished castings in which cores have been used. The company will be represented at the booth by W. L. Goetz, H. A. Swales, J. N. Yaeger, E. G. Allen, E. A. Medbery, H. J. Strassberger and E. J. Felt

KLING BROS. ENGINEERING WORKS, Chicago—This company will exhibit a new line of small sized, high-speed grinders which use either rubber bonded or bakelite grinding wheels. The representatives will be T. E. Kling, O. E. Kling and H. J. Aagaard.

KNEFLER-BATES CO., Indianapolis—Core binder, facing flour and examples of cores will be shown at the booth of this company by Ernest Knefler, George B. Hill, Herbert J. Bever, John A. Green and Mabel Tyner Buck.

H. KRAMER & CO., Chicago—This company will show brass and bronze ingots and will be represented by H. Kramer, I. Kaden, L. Chapman, Wm. Romanoff, N. F. Kepner and S. M. Marks.

L

LANCASTER COAL & SAND CO., Lancaster, O.—Molding sands and bonding materials will be shown by this company. The representatives will be T. R. Hummell and D. L. Hansberger.

LAVA CRUCIBLE CO. OF PITTSBURGH, Pittsburgh—Graphite crucibles, nonferrous melting furnace refractories, such as linings, base blocks, furnace covers, plastics and maintenance cements, and standard shapes in refractory brick and tile will feature the display of this company. Furman South Jr., D. E. MacLean and R. P. South will be in charge of the display.

LINDE AIR PRODUCTS CO., New York—Oxyacetylene cutting and welding equipment used in cutting risers and reclaiming defective castings will be shown by this company. Representatives will be E. J. Hayden, L. M. Rasmussen, W. C. Harrison, J. W. Haygood and R. W. Boggs.

LINDSAY-McMILLAN CO., Milwaukee—Core oils and compounds and cores made from these products will be shown by this company. Charts giving valuable information regarding the baking time of cores, also will be exhibited. Representatives will be W. R. Pate, J. A. Gitzen, A. E. Welch, R. G. Walker, M. A. Pollard, R. C. Hardie and A. H. Huisken.

LINK-BELT CO., Chicago—This company will show an operating model of a vibrating screen, a herringbone speed reducer, conveyor idler assembly, samples of elevating conveying and power transmission chains and photographs of foundry installations. The representatives will be J. J. Hartley, W. L. Hartley, E. L. Berry, R. J. Heisserman, L. A. Spillan, A. K. Sjolander, H. Bergstrom, Martin Kidder, J. F. Kelly, J. S. Holl, F. B. Caldwell, Norman Smith, W. C. Carter and George O'Connor.

LOUDEN MACHINERY CO., Fairfield, Ia.—This company will show an electric pouring device and material handling equipment such as overhead tracks and trolleys, traveling cranes and other equipment. Those in attendance will be L. F. Berthold, A. Neher, J. A. Niles, W. H. Schwerman, P. J. McCain, W. H. Huenergardt, Paul Hassler, R. B. Louden, R. Bruce Louden and Roy Louden.

LOWE MFG. CO., Detroit—This company will show an electric sand sifting machine and will be represented by R. G. Lowe.

Mc

MACLEOD CO., Cincinnati—A sandblast machine completely equipped, a small sandblast barrel, brass and copper blacking sprayers and a model dust arrester will be shown at the booth of this company which will be in charge of Walter Macleod and James Lauder.

McCLOUD RIVER LUMBER CO., San Francisco—Pattern lumber will be shown.

R. W. McILVAINE CO., Chicago—This company will show photographs of sand and mold handling systems and cupola charging apparatus as well as a portable instrument for determining the moisture in molding sand. Representatives will be R. W. McIlvaine, R. L. McIlvaine, Paul Ackerman, A. A. Ross and W. A. Forbes.

M

PAUL MAEHLER CO., Chicago—Core ovens and temperature control equipment will be shown by this company. A. E. Maehler, H. R. Fox and H. R. Madson will be in charge.

MALLEABLE IRON FITTINGS CO., Branford, Conn.—Foundry vibrators, including a new model of flask rapper will be shown by this company. George B. Pickop will be in charge of the display.

MANHATTAN RUBBER MFG. CO., Passaic, N. J.—Rubber bonded high speed grinding wheels will feature the display of this company. Representatives will be N. Clif Hilton, W. H. Steinberg and C. E. Forney.

MARSCHKE MFG. CO., Towson, Md.—This company will show motor driven grinders of various types and will be represented by R. W. Procter.

MATHEWS CONVEYER CO., Ellwood City, Pa.—Sections of standard heavy and extra heavy duty roller conveyor for handling molds and castings, and a ball bearing turntable will be on display. Representatives will be J. H. Hough, H. J. Smith, A. M. Wright, F. F. Stoll and H. Cucullu.

MILWAUKEE ELECTRIC CRANE & HOIST CO., Milwaukee—A roller bearing crane trolley in full running order, a model of single line

foundry bucket and photographs of cranes and hoists will be shown by this company. The representatives will be H. S. Strouse, D. B. Patterson, F. J. Page, C. L. Mayer, H. P. O'Neill, Alex Paulsen and F. R. Quigley.

MODERN POURING DEVICE CO., Port Washington, Wis.—Cranes, pouring devices including a new electric pouring device, and photographs of a sand-handling system will feature the display of this company. W. Knappe will be in charge of the display.

MOLINE IRON WORKS, Moline, Ill.—Squeezer type molding machines will be displayed at the booth of this company by L. E. Nutt.

MOLTRUP STEEL PRODUCTS CO., Beaver Falls, Pa.—This company will show foundry pattern plates, solid and perforated core plates and bottom boards, and will be represented by F. F. Ward and D. C. Russell.

MT. JEWETT FIRE CLAY CO., Mt. Jewett, Pa.—Molding sand bond, blended fire clays for bonding iron and steel foundry sands and ground fire clay for cupola and ladle work will be shown by E. M. O'Neill, A. F. Shaffer and R. J. Wiser.

N

NATIONAL ENGINEERING CO., Chicago—A laboratory size muller type sand mixer will be shown in operation. Other items to be exhibited include blueprints and photographs of sand preparing, sand handling and mold handling installations made by this company; photographs of specially equipped mixers for reclaiming waste foundry sand, and mixers for installation in continuous sand handling systems. The company will be represented by H. S. Simpson, A. G. J. Rapp, B. Castor, A. C. Christensen, W. H. Schulte, W. A. Kellogg, C. J. Skeffington, W. C. Edgar, George G. Crewson, A. E. Smith and C. D. Hollins.

NATIONAL SMELTING CO., Cleveland—Aluminum ingot metals will be shown at the booth of this company.

NEW HAVEN SAND BLAST CO., New Haven, Conn.—A small pressure sandblast barrel and dust arrestor equipment will be shown. Representatives will be D. S. Sammis, S. S. Parsons, R. Wisely and W. R. Matteson.

WM. H. NICHOLLS CO., INC., Richmond Hill, L. I., N. Y.—This company will exhibit a line of molding machines including jolt squeezers, both the stationary and the portable types, jolt squeeze strip machines and a flask roll-out device. The following will be in attendance: Wm. H. Nicholls, D. Petrocelli, G. Anderson and L. R. Schocken.

NORTHERN ENGINEERING WORKS, Detroit—Cranes, trolleys and electric lift hoists will be shown by this company. The exhibit will be in charge of H. W. Standart, W. W. Peattie and M. O. Haeger.

NORTON CO., Worcester, Mass.—Various types of grinding wheels, grinding wheel floor stands and swing frame grinding machines will be featured at the booth of this company. Representatives will be G. W. Thomson, J. B. Eckstedt, W. N. Jove, R. W. Cornish and F. H. Stenberg.

O

S. OBERMAYER CO., Chicago—Snap flasks, jackets and other foundry supplies will be shown by this company. S. T. Johnston, E. D. Frohman, H. S. Simpson, T. Kauffmann Jr., J. E. Evans, O. W. Josephson, J. J. McDevitt, O. C. Olson, O. J. Peterson, A. N. Wallin, F. B. Flynn, G. E. Doyle, R. S. Higgins and V. C. Bruce will be in attendance.

OILESS CORE BINDER CO., Cleveland—This company will show samples of a core binder, core wash and core paste together with castings and cores showing the results obtained from these materials. The representatives will be J. H. Bruce, J. A. Hamilton, and H. A. Baker.

OLIVER MACHINERY CO., Grand Rapids, Mich.—A line of pattern shop equipment including woodworking machinery will be featured by this company. Representatives will be A. S. Kurkjian, G. C. Conklin, M. O. Larson, F. F. Middleton, C. A. Ginter, C. R. Crossley, G. W. Crossley, R. S. Gill, J. R. Duthie and J. E. McLauchlen.

OSBORN MFG. CO., Cleveland—This company will exhibit a jolt squeeze pattern draw molding machine, a jolt stripper and a core machine. Each machine will be equipped with pattern and core box for making dummy molds. The representatives will be J. D. Wise, E. T. Doddridge, H. B. Klar, G. G. Adam, Wm. Rawlinson, K. Shuto.

P

PANGBORN CORP., Hagerstown, Md.—This company will exhibit sandblast and dust collecting units and models, drawings and photographs showing complete installation of equipment. The representatives will be Thomas W. Pangborn, John C. Pangborn, H. D. Gates, P. J. Potter, F. J. Hull, W. A. Rosenberger, M. I. Dorfan, C. A. Boultman, Harold Holden, W. C. Lytle, J. F. Lewis, J. J. Carr, C. T. Bird, L. W. Wagner, W. T. Randall, F. E. Wolf and E. C. Gilmour

PEERLESS SAND CO., Conneaut, O.—Molding sands, core sands and bonding and refractory clays will be featured at the booth of this company which will be in charge of F. L. Moore, C. E. Moore, and C. J. Dow.

PENNSYLVANIA LUBRICATING CO., Pittsburgh—This company will show various grades of core oils and cores and finished castings made in plants where these core oils are used. The representatives will be C. G. Purse, G. R. Meyers, J. M. Lutz, C. N. Wolgamood, G. F. Morgan, W. C. Clark, H. P. Bittinger.

PENTON PUBLISHING CO., Cleveland—The booth of this company will be fitted up as a rest room where those attending the convention are invited to make their headquarters. The representatives will be H. Cole Estep, J. D. Pease, E. L. Shaner, Dan M. Avey, Frank G. Steinebach, Pat Dwyer, Edwin Bremer, F. B. Pletcher, G. B. Howarth, L. C. Pelott, S. H. Jasper, A. L. Klingeman, C. A. Wardley and J. J. Kerr.

PICKANDS, BROWN & CO., Chicago—Samples of pig iron will feature the display of this company.

PITTSBURGH ELECTRIC FURNACE CORP., Pittsburgh—Photographs of electric furnace installations and castings made with metal melted in that type of equipment will be shown by this company. The representatives will be W. B. Wallis, W. E. Lewis, H. H. Watson, W. E. Moore, G. L. Simpson and Presley Hamilton.

PORT CRESCENT SAND & FUEL CO., Detroit—Samples of core sands and castings made in molds of that material will be shown by this company. Representatives will be A. N. Farmer, N. P. Dessert, George F. Scott, W. I. Sallee, M. P. Drennan, C. F. Nugent, William F. Maybank, C. N. Spidell.

PYROMETER INSTRUMENTS CO., New York—This company will show various types of instruments designed to determine temperatures of molten metals.

R

ROGERS, BROWN & CROCKER BROS., Cincinnati—Samples of pig iron, coke, ferromanganese, molding sands, aluminum, and other materials will be shown. Representatives will be L. H. Miller, G. R. Sullivan, T. A. Wilson, C. B. McLaughlin, S. B. Morrison, C. P. Hellwig, W. J. Loughery, A. J. Wentworth, F. W. Bauer, J. C. Mears, W. E. Oelschlarger and J. R. Morehead.

ROYER FOUNDRY & MACHINE CO., Wilkes-Barre, Pa.—Models of sand separating and blending machines will be featured by this company. Those in attendance will be G. F. Royer, John Lloyd, S. B. Davies, Wm. Fenton, Alexander Haigh and Stewart Lloyd.

ROHRBACHER SHOE CO., Boston—Various types of safety shoes will be featured at the booth of this company which will be in charge of A. L. Rohrbacher, Jr., H. L. Blanchard and M. L. Sheehan.

RUEMELIN MFG. CO., Milwaukee—This company will show sandblast cabinets and blast guns, sandblast helmet and a sandblast generator. R. Ruemelin and H. A. Flitz will represent the company.

S

SAFETY CLOTHING CO.—Safety clothing made from asbestos, leather and fire proof duck, safety guards for various types of machines, respirators for dust, smoke and fumes, and sandblast helmets and hoods will be shown by this company. Those in attendance will be Allen Clark and Roland Jones.

SAFETY EQUIPMENT SERVICE CO., Cleveland—Safety equipment will be featured.

SAFETY FIRST SHOE CO., Framingham, Mass.—This company will show samples of its complete line of safety shoes. The exhibit will be in charge of Edgar C. Davidson.

SAFETY GRINDING WHEEL & MACHINE CO., Springfield, O.—Organic bonded wheels for high speed grinding, and grinding machines especially adapted for the use of high speed wheels will be exhibited by this company. The representatives will be Charles W. Gwyn, H. G. Weinland, F. W. Perry, Howard Lanyon, H. H. Moennich, H. G. Bennett.

SEMET-SOLVAY CO., New York—Samples of foundry coke will be exhibited at the booth of this company. Representatives will be J. M. Woods, E. L. Kyle, S. Weiss, A. E. Scherm, and R. H. Watson.

SHEPARD NILES CRANE & HOIST CORP., Moutour Falls, N. Y.—This company will show a compact type single I-beam hoist and photographs of material handling equipment applied in the foundry industry. Those in attendance will be R. T. Turner, F. G. Bell, F. E. Meeks, W. B. Briggs, H. A. Baugh and G. G. Robbins.

W. W. SLY MFG. CO., Cleveland—This company will show a sand reclaiming unit and will conduct a series of molding sand tests in the booth to show the percentage of sand which may be reclaimed with that type of equipment. Photographs and drawings also will show installations of the line of foundry equipment which it manufactures. The following members of the organization will be in attendance: S. C. Vessy, George A. Boesger, F. A. Ebeling, R. W. Hasselle, C. P. Guion, R. O. Mullen, H. W. Gaeckle, D. L. Harris, W. L. Kammerer, M. T. Mortensen and O. A. Wilhelmy.

WERNER G. SMITH CO., Cleveland—Samples of core oils and specimen cores made from these oils will be shown. The company will be represented by Werner G. Smith, Milton S. Finley, L. P. Robinson, Frank H. Dodge, Ray Hunter, A. S. Coulter, John Glass, Wm. R. Rayel, George H. Graham and Louis F. Ferster.

SMITH OIL & REFINING CO., Rockford, Ill.—Samples of core oils and cores made from these products will be shown by this company.

SPENCER TURBINE CO., Hartford, Conn.—Turbine compressors for supplying air for cupolas, oil and gas burners and other industrial heating equipment will be shown by this company.

STANDARD SAFETY EQUIPMENT CO., Chicago—A sandblast mask, safety washers for grinding wheels, goggles and safety wearing apparel will be shown. The representatives

(*Continued on Page* 313)

Will Supplement Valuable Service Feature

Leading Experts Will Back Active Organization of THE FOUNDRY In Continuing and Increasing Question and Answer Departments

THE FOUNDRY announces the establishment of an advisory staff made up of men whose day-to-day contact with a definite branch of the industry that each represents, affords intimate knowledge of the latest developments. These men are recognized as outstanding experts, equipped by ability, education and training to speak with authority on their several specialties in the foundry field.

The advisory staff as now constituted includes the following:

Steel Foundry Advisor

John Howe Hall
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

Malleable Foundry Advisor

H. A. Schwartz
National Malleable & Steel Castings Co.
Cleveland, O.

Gray Iron Foundry Advisor

John W. Bolton
The Lunkenheimer Co.
Cincinnati, O.

Charles Vickers, consulting engineer, Buffalo, N. Y., long actively identified with THE FOUNDRY staff will continue both as active editor and advisor on nonferrous problems. Mr. Vickers' years of experience, his constant contact with the industry, his early training as a practical man supplemented later by theoretical and scientific training, qualify him to continue to give to this position the expert attention which nonferrous foundry problems require.

These men will supplement the regular staff of editors of THE FOUNDRY who will continue, as has been the custom since the establishment of the paper, to answer specific questions bearing on shop operation, management, metallurgy, and the manifold problems which arise in foundry operations.

Older readers will recall that since the early years of its existence, THE FOUNDRY has been called upon constantly to answer questions. These have been handled by the editors with the co-operation of a number of men whose names are high in the list of those who have made American foundry practice what it is today. Among those were W. J. Keep, Thomas D. West, Dr. Richard Moldenke, Charles Vickers, and H. E. Diller. In more recent years, with the growth of the magazine, the active staff of editors has been extended to include practical foundrymen familiar with steel, gray-iron, malleable and brass practice, including chemists, metallurgists and engineers who have had much experience.

John Howe Hall

Is metallurgical engineer, Taylor-Wharton Iron & Steel Co., High Bridge, N. J. He was born June 20, 1881 at South Portsmouth, R. I. He received his education at Harvard university and was graduated in 1902 with an A. B. degree. In 1903, Mr. Hall received his master's degree from the same school for work in metallurgy under Prof. Albert Sauveur. He has been associated with the Bethlehem Steel Co., Bethlehem, Pa.; Buffalo Crucible Casting Co., Buffalo; Quigley Furnace & Foundry Co., and since 1915 has been identified with his present firm. Mr. Hall is the author of *The Steel Foundry* and many articles for the technical press. He also has contributed many papers to the various societies of which he is a member.

The inauguration of the advisory staff will serve to enhance the service of THE FOUNDRY'S trained staff of editors, by supplementing their general knowledge with the practical specific information which intimate contact with the foundry and the laboratory alone can give.

As in the past, all questions relating to specific problems should be sent directly to the publication office of THE FOUNDRY. Such questions, when submitted by bona fide subscribers will be answered directly by mail from this office. The answers, in many instances will be provided from the files, from a scanning of the foundry literature of the entire world, or from the experience of the active editors. In event that the editors wish to check these answers or to secure additional or supporting data, the questions will be referred to the proper expert of the advisory staff. The answer, in either case, will be sent by mail to the inquirer.

A selection of those questions which are typical, dealing with new practice, or which are of educational value, will be presented in the pages of THE FOUNDRY, as in the past. In no case should any question be sent to any individual of the advisory or active staff, for all questions and answers must clear through the editorial department of THE FOUNDRY, Penton building, Cleveland.

In securing the co-operation of this advisory staff to back up the work of its editors, THE FOUNDRY has taken another long forward step in the service of its industry. The publishers view their responsibility as reaching far beyond the more commonly accepted field of those who print and sell magazines for profit. They feel that the position occupied by THE FOUNDRY for the past 37 years places upon the publication certain duties which may be performed better and with greater benefit to all foundrymen through the active assis-

tance of men of such high standing as those who compose the advisory staff.

In assuming their work on the advisory staff, Mr. Hall, Mr. Schwartz and Mr. Bolton are offering to the industry a high measure of service. They see in this work an opportunity to become teachers after a practical fashion, and hope to disseminate knowledge through which the entire foundry world will benefit. The companies with which they are identified, also, are making an important contribution in line with modern American views on industrial co-operation. To those companies and to the men who are rendering this service, THE FOUNDRY expresses its profound appreciation, voicing this appreciation on the part of its readers who will benefit directly.

Broader questions, answerable only through a study of the individual problems and involving consulting service, of course, cannot be handled either by the editorial or advisory staff. Consulting experts are available for cases of this nature and reference gladly will be given to such experts in event that consulting service is required. Furthermore, each member of the advisory staff through his connection with an outstanding manufacturing establishment, possesses confidential information, the property of his employer. Obviously, such information cannot be divulged in answer to questions that may be asked through THE FOUNDRY.

The establishment of the advisory staff affords the editors of THE FOUNDRY a positive check, an assurance of the best judgment obtainable upon problems of the industry. This will result in an even higher standard of accuracy in answering the questions of its readers, an added feature of service and a real contribution to the advance of castings manufacturing methods.

BACHRACH

Harry A. Schwartz

Since 1920, has been manager of research of the National Malleable & Steel Castings Co., Cleveland. He was born in Kentucky in 1880 and received his education at Rose Polytechnic institute, Terre Haute, Ind. He was graduated from that school in 1901 and in 1903 and 1905 received his master's and professional degrees. Since his graduation he has worked for the National Malleable & Steel Castings Co., at Indianapolis from 1902 to 1920 and at Cleveland from 1920 to date. Mr. Schwartz is a member of several technical societies and has contributed many papers at their meetings. He also is the author of *American Malleable Cast Iron* and articles for the technical press.

Issues Bulletin

Department of engineering research, University of Michigan, Ann Arbor, Mich., recently has issued engineering research bulletin No. 11 on the stability of metals at elevated temperatures. According to the bulletin two of the outstanding problems at present involved in the use of metals at elevated temperatures are the development of a short time test for determining the load-carrying ability of a metal at these temperatures and the determination of the effect of various alloying elements upon the high temperature stability of alloys. Much work has been done on the first of these two problems but up to the present time the only way of accomplishing this has been by long-time creep tests. Effort has been made to relate the results from creep tests with those obtained from the usual short-time tensile tests but thus far none of the results has been successful.

The second problem has received but little theoretical attention. The investigation whose results are published in the bulletin was undertaken to aid in throwing some light on these problems. The bulletin explains the method of procedure to secure the data, the apparatus used, the results obtained and a mathematical interpretation of these results. From the results obtained, conclusions were drawn that if stability is desired at any temperature below the equi-cohesive temperature, it may be accomplished in the following ways: by the addition or formation of any element, compound or constituent which does not enter into solid solution with the matrix but which by its presence interferes with the crystal slippage, or by the addition or formation of any element, compound or constituent which tends to increase the amount of amorphous material existing between the grains of crystal in metals and like substances. If stability is desired at any temperature above the equi-cohesive temperature, the following ways are available: (1) The addition or formation of any element, compound or constituent which decreases the relative amount of amorphous material will increase the load-carrying ability or (2) by the addition or formation of any element, compound or constituent which strengthens the amorphous boundaries by interfering with the plastic flow will increase the load carrying ability. The bulletin contains 122 pages and contains sketches and views of the apparatus used in the experiments also many tables and curves which aid in interpreting the results. The bulletin may be obtained by addressing the director, department of engineering research, Ann Arbor, Mich. The price is $1.

John Ward Bolton

Is in charge of the research and technical control of the Lukenheimer Co., Cincinnati. He was born in Terre Haute, Ind., Jan. 20, 1897. He was educated at Rose Polytechnic institute, in that city, was graduated in 1918 with a B. S. in chemical engineering and received his master's and professional degrees from the same school in 1921 and 1925 respectively. Mr. Bolton has served as chemist and metallurgist for Procter & Gamble Co., Niles Bement Pond Co., Black Clawson Co., Hamilton, O., and the Frank Foundries Corp., Moline, Ill. He is the author of numerous technical papers which have been presented to technical societies both in the country and abroad.

Recently the third edition of the trade standards adopted by the Compressed Air society, 90 West street, New York, has appeared. Included in the booklet are nomenclature and terminology, definitions, standard tests, capacities, methods of installation, etc. The price of the booklet is 50 cents.

Questions & Answers on FOUNDRY PRACTICE

STEEL

Maximum Toughness Is Obtained

QUESTION

In annealing steel castings is it better to wait until the castings have cooled over night before putting them in the furnace? If in an urgent case, could small gear castings containing about 0.70 per cent carbon, be annealed 5 or 6 hours after casting? What is the best process of annealing to obtain maximum toughness? Are any books published dealing with annealing?

The common practice is to allow the steel castings to cool. They are then cleaned of adhering sand and annealed. It is not necessary, but takes more time to heat up the casting as the sand forms a sort of protecting coat. The castings therefore may be annealed as soon as they can be handled, and the procedure is as follows to obtain maximum toughness:

Heat to 850-900 degrees Cent. (1562-1654 degrees Fahr.) and hold from 2 to 4 hours after the castings are hot through. The castings then may be cooled rapidly by quenching in water, oil or by air blast. As soon as the castings reach a black heat when quenched they should be allowed to cool slowly.

Accelerated cooling always must be followed by a second reheating at a lower temperature than the first. Oil and water quenched castings should be heated between 640-680 degrees Cent. (1184-1258 degrees Fahr.) and held from 2 to 8 hours to obtain the maximum toughness. In the case of air cooled castings the temperature may be from 660 to 700 degrees Cent. (1220-1292 degrees Fahr.) and held at this heat from 2 to 6 hours. Do not exceed the upper limit of the temperature range if the best results are to be obtained. The use of a pyrometer will assist materially in checking up the temperatures. There is no book that deals with annealing only, as far as we are aware, but many books on steel founding mention it.

THIS department covers all problems relating to metallurgical, melting and molding practice encountered in making steel, malleable-iron and gray-iron castings. Questions submitted by bonafide subscribers to this department will be answered by members of the editorials staff of The Foundry, supplemented where occasion requires by the advisory staff whose personnel is as follows:

John H. Hall—Steel Casting
H. A. Schwartz—Malleable Cast Iron
J. W. Bolton—Gray Cast Iron

All questions should be addressed to The Foundry, Penton Building, Cleveland.

Q & A

Is Aluminum Used?

QUESTION

Recently we received an inquiry from our German branch requesting information on the use of a mixture of oil and aluminum powder on molds for steel castings. Since our information on this subject is limited, we wonder if you have any data that you could give us. We understand that due to the high temperature involved it is necessary to use silica sand which is coarser than that employed for cast iron molds, and that it is the practice to make a paste of aluminum powder or some other substance with oil, usually linseed or core oil, which is applied to the inside surface of the mold.

ANSWER

As far as we can ascertain aluminum powder is not used, at least in this country, as a facing for steel molds. Metallurgical authorities state that the aluminum only would act in the same capacity as silica flour, that is to close up the pores of the sand. Generally a mixture of fine silica flour mixed with water is sprayed on the mold surface to give a more refractory surface, and fill up the surface sand pores. At one time a mixture of silica flour, rosin and gasoline was sprayed on the mold surface and ignited. The idea was to get a skin drying effect, but we do not know if it was as successful as using a torch.

At various times an intimate mixture of aluminum powder and iron oxide has been placed in the risers or gates to keep the metal from solidifying. When the aluminum and iron oxide are ignited, the iron oxide is reduced to the metal and and the aluminum to the oxide. The reaction involved produces an enormous amount of heat which keeps the metal in the gate molten.

The only place that we know that oils are used is in coremaking. These oils have a linseed base and are compounded with rosin, crude oil, soy bean oil, etc. It may be that the aluminum powder mixture is a recent German development and is being maintained as a business secret.

Q & A

Steel Dies Break

QUESTION

Constant breakage of forging dies has given us much trouble and we desire your comments on: What constitutes a good die block; ingredients and composition of steel to be used, and to what extent steel should be hardened, stating whether it should be case hardened, semihardened throughout or fully hardened.

ANSWER

The present tendency is to employ alloy steels for dies in drop forging. The first cost is higher than that of carbon steel dies but it is cheaper in the long run due to longer life and less warping or spoilation of the im-

pression. Data on analysis and heat treating, etc., are as follows:

Heat resisting die blocks will contain 3.50 to 4.00 per cent chromium, 0.80 to 0.90 carbon, and 0.50 to 0.60 per cent manganese. The heat treatment is to heat to 1750 to 1850 degrees Fahr., and cool in air, or the blocks may be oil quenched and then drawn to 800 to 1000 degrees Fahr. Where the dies must withstand strains and heat such as, punches for shallow holes, trimmer dies, etc., the analysis should be 16 to 18 per cent tungsten, 3 to 4 per cent chromium and 0.40 to 0.50 carbon. The heat treatment is the same as for the following steel.

Where heavier strains and higher heat must be undergone such as in the case of gripper dies, heading tools of special shape, punches for deep holes, etc., the following steel will answer: 8 to 10 per cent tungsten, 3 to 4 per cent chrome and 0.25 to 0.30 per cent carbon. These dies are less likely to break. The heat treatment is to preheat to 1500 to 1600 degrees Fahr., then bring to 2250 degrees or until the surface appears to flow or flux. It is then air cooled. With lower carbons the steel may be oil quenched and drawn from 800 to 1000 degrees Fahr. Dies always should be tested for hardness before using. Gripper dies of plain design and ample proportions should test from 75 to 80 scleroscope hardness, inserts from 55 to 60 hardness, and heading tools from 60 to 65.

In case of breakage, the drawing temperature or the time element should be increased. If this does not help, then steels containing lower amounts of tungsten should be tried with the increasing of the drawing of the time elements if necessary. If the difficulty continues, the tougher chrome steels will have to be used.

MALLEABLE

Makes Cupola Malleable

QUESTION

We are contemplating the manufacture of malleable iron in the cupola and would like to obtain a good mixture for light castings.

ANSWER

Light malleable castings made from cupola malleable should have an analysis of approximately 0.60 to 1.00 per cent silicon, sulphur under 0.10 (but good castings have been obtained with sulphur as high as 0.20), phosphorus from 0.15 to 0.225 per cent, manganese 0.3 to 0.4 per cent as cast. Your mixture or charge may have a composition of 55 per cent pig iron, 30 per cent hard iron scrap and 15 per cent steel. The pig iron analysis should be approximately 1.00 to 1.50 per cent silicon, under 0.05 per cent sulphur, phosphorus 0.15 to 0.225 per cent and manganese 0.40 to 0.60 per cent.

Your attention is called to an article, "Cupola Malleable Production" in THE FOUNDRY, Dec. 1, 1922 and also to another, "Desires Semimalleable Cast Iron" which appears on page 668, Aug. 15, 1925 issue of THE FOUNDRY.

Another article entitled, "Metal for Malleable Iron Fittings Melted in the Cupola," appeared in the Nov. 1, 1927 issue. The author of the article recommends that a 1-inch diameter bar be cast every 15 minutes during the heat, and fractured after ordinary cooling. If the bar shows a mottled structure, thin castings will have a white structure as cast. If the fracture shows white, the metal is too low in silicon, and if the fracture is gray the silicon is too high. In practice the white bar is called *high* iron and the gray, *low* iron.

Q & A

Many Applications

QUESTION

Can you advise me or refer to some book that will give me information on the relative quality of air furnace and cupola malleable iron castings? Is it possible with proper practice to produce equal or better castings from the cupola as compared with those produced from the air furnace? Which has the lowest melting cost?

ANSWER

Malleable iron produced in the air furnace in this country, generally is conceded to be a better product than that from the cupola. Air furnace malleable iron has a minimum tensile strength of 50,000 pounds per square inch and a minimum elongation of 10 per cent. Cupola malleable may have a tensile strength from 35,000 to 45,000 per square inch, generally the lower figure. The elongation is considerably less than that of air furnace iron. It is unlikely that the quality of cupola malleable can be brought up to that of air furnace iron because of the better control allowed in the air furnace. Cupola iron has a total carbon content around 3.2 per cent and that of air furnace iron is about 2.75 per cent. The higher carbon in cupola iron is due to the contact with coke. The higher carbon lowers the malleability and the elongation.

We have no figures as to the relative cost of either of these malleable irons, but there is no doubt that cupola iron can be melted cheaper than air furnace iron. Cupola malleable iron requires a higher annealing temperature than air furnace iron, about 200 to 300 degrees higher, or 1700 to 1800 degrees Fahr., consequently the cost of annealing is higher and the wear and tear on the annealing pots is greater. Many companies make malleable iron in the cupola for small castings, such as, agricultural and pipe fittings. It is claimed that the cupola iron does not withstand impact as well as air furnace metal, and hence, cannot be used where resistance to shock is sought.

GRAY IRON

Wants to Use Nickel

QUESTION

For many years we have been producing castings for lawn mowers. These castings require an analysis similar to stoveplate. The sections are thin and should have the maximum strength as well as machinability. To obtain the maximum machinability we are forced to carry the silicon around 3.25 per cent which we understand decreases tensile strength. Could we use nickel or chromium or both to reduce our silicon content, eliminate hard spots and increase tensile strength?

ANSWER

We believe that the silicon content of 3.25 per cent, of the iron used for your type of castings is quite high and that you may secure just as much machinability with a silicon content of 2.50 per cent, and obtain a stronger iron. From considerable experience in a large cast-iron radiator foundry where the section of the bar or column was not over $\frac{3}{32}$-inch thick we would say that the highest that the silicon was allowed to go was 2.30 per cent and that seldom. The average was around 2.15 per cent. This shop used 18 to 25 per cent stoveplate scrap also besides its own return shop scrap. If all pig iron would have been charged, the silicon would have to be held around 1.80 per cent. These radiator sections were reamed and tapped in automatic machines and no difficulty was observed in machining. One feature of pouring thin sections such as radiators is that the iron must be extremely hot and liquid.

If you desire to use an alloy, we would suggest that you try nickel rather than nickel-chromium in thin sectioned castings. To secure the best results from nickel additions, the combined carbon must be around 0.80 per cent, and this would necessitate a much lower silicon than you are using at present. We cannot say

offhand just what percentage this would be, but imagine about 2.0 per cent or lower. The best method of attacking your problem of securing the greatest strength with maximum machinability would be to reduce gradually the silicon content until the happy medium were reached. Then, if greater strength were desired, add nickel and continue to reduce the silicon allowing 1 per cent nickel for each ½ per cent silicon.

You do not mention the phosphorus content of the iron used in making lawn mower castings, and since these castings are subject to more or less impact or shock, we would suggest that the phosphorus be kept low, say not over 0.30 per cent. You will find no difficulty in pouring this metal if it is melted hot and clean in the cupola.

Q & A

Inserts in Brakeshoes

QUESTION

We would like to know what is used to line brakeshoes, and especially whether nickel or other white metal is ever employed.

ANSWER

We know of no cases in which nickel or other white metal is required for lining brakeshoes. In some types of brakeshoes inserts of manganese steel are cast into the iron, in others bundles of expanded metal (sheet steel which has been cut and drawn apart, such as that used for metal lathing) serve as a core for the brakeshoe. This soft steel clings to the wheel and gives more friction than the hard, cast iron. In some brakeshoes the brake surface is chilled and the back of the shoe is gray iron. Such an iron will contain about 1.25 per cent silicon, and the sulphur should not be above 0.12 per cent.

Q & A

Makes Hard Iron

QUESTION

Will you give us a formula for a practical mixture for hard iron crusher plates? These plates are not to be chilled on the face, but are to be composed of hard, white iron. So far we have been able to secure sufficient old plates for remelting, but as the supply is decreasing we will have to resort to a new method.

ANSWER

Crusher plates should not only be hard but also they must withstand abrasion and wear, and be tough. Chromium additions will give the required hardness and add to the wearing qualities of the metal and we suggest that you incorporate this element into your mixture by the addition of pig iron containing chromium or by the addition of ferrochromium. We suggest the following analysis of the finished plates:

Element	Per Cent
Chromium	0.60-0.80
Silicon	0.70-0.90
Manganese	0.70-0.90
Total Carbon	3.00-3.50

Another analysis suggested, if chromium bearing metals are not obtainable easily:

Element	Per Cent
Silicon	0.80-1.00
Sulphur	0.08-0.10
Phosphorus	0.20-0.40
Manganese	0.80-1.20
Comb. Carbon	High

In the first analysis it will take about 35 per cent of chromium bearing pig iron or 12 pounds of ferrochromium (60-70 per cent Cr.) per 1000 pounds of iron to get the required amount of chromium in the cast. Steel may be used to lower the carbon content. Use about 10-15 per cent in this mix and 20-30 per cent in the second one given. The low silicon is the controlling factor that gives the white fracture by holding the carbon in the combined state. White cast iron has a greater contraction than gray and freezes quicker. This necessitates a quick pouring so that the metal will run in the thin sections and present cold sheets.

Q & A

How Much Sand?

QUESTION

We are interested in securing data that will enable us to calculate the weight of sand in a mold in comparison to the weight of the casting in the same mold. Has any information been published or do you know if any data is available on this subject?

ANSWER

To the best of our knowledge no data ever has been collected showing the weight of sand in a mold in comparison to the weight of the casting poured in the same mold. Personally we cannot see what possible value the figures would have even had they been collected. The conditions under which castings are produced vary to such an extent that figures compiled on the basis you mention would have no practical application.

For example, on 100 flasks containing molds for saddlery hardware, the total casting weight might not run over 100 pounds. The total weight of sand in the molds may run to 8000 pounds, a ratio of 80 pounds of sand to 1 pound of castings. In an ingot mold foundry 1000 pounds of sand will make a mold for a 6000-pound casting, a ratio of 1 pound of sand to 6 pounds of castings.

One foundry may use special shaped flasks closely following the contour of the pattern. Manifestly an intelligent comparison cannot be drawn between the amount of sand used in that shop and the amount used in a second foundry running on the same class of castings, but with ordinary shaped flasks. With all due respect, we think you are wasting your time. You might just as well try to determine the exact ratio that should exist between the hole and the rim of a doughnut. No matter how you juggle the figures you must have enough dough to surround the hole and you are as far ahead at the end of the calculation as you were at the beginning.

Q & A

Desires Chromium Data

QUESTION

We wish to increase the hardness of cast iron and find that chromium does the work all right, but we have not been able to find any data on its use in cupola operation. Could you assist us? Also we would like to know the approximate melting point and other physical data, present market price, source of supply and any other useful data on ferrochromium.

ANSWER

Ferrochrome may be added either to the ladle or to the charge in the cupola. When used in the ladle, the ferrochrome should be in small pieces about ¼-inch in size, and the iron must be hot to assure proper mixing. Preheating the chrome aids considerably. The best way to add ferrochrome to the cupola is to put it in containers of sheet steel. These containers will prevent oxidation of the alloy as it drops down the cupola, until the melting zone is reached. When used in containers, the size of the alloy should not exceed 1 inch in size. The containers must be distributed uniformly to obtain uniform results. Recovery may be assumed at 75 per cent. Ferrochrome never should be placed loosely in the cupola as the loss by oxidation is extremely high.

The approximate melting point of ferrochrome is from 2050 degrees Fahr. to 2250 degrees Fahr., and since good hot iron from the cupola is seldom less than 2400 degrees Fahr., no trouble should result except where large quantities of the alloy are added to the ladle. In the

case of large quantities, a chilling of the iron will take place. The chromium content is from 65 to 70 per cent and carbon from 0.20 to 2.00 per cent in low carbon ferrochrome and from 4 to 8 per cent in high carbon ferrochrome. Ferrochrome is added to cast iron to increase the hardness and also its resistance to oxidation at high temperatures. Additions of ferrochrome to cast iron are from 1 to 14 per cent, the higher ranges being for heat resisting purposes.

The present market price for this alloy is 11½ cents a pound for the 4 to 6 per cent carbon, 19 cents for the 2 per cent, and 29 cents a pound for 0.20 per cent carbon. Consult advertising pages of THE FOUNDRY for sources of supply.

GENERAL

Determines Temperature

QUESTION

Can you advise us how we can determine the temperature of a nickel-copper alloy in a crucible? This alloy must be poured between 1200 and 1300 degrees Cent., and we have not been able to satisfy ourselves that pyrometer application of the thermocouple type would work.

ANSWER

Temperature of the nickel-copper alloy may be determined with either a platinum-rhodium thermocouple or an optical pyrometer. The platinum-rhodium couple will measure temperatures of 1500 degrees Cent. as it melts at 1730 degrees Cent. The thermocouple must be protected with a silica or porcelain tube to prevent destruction of the elements. The optical type will measure temperatures as high as 3000 degrees.

In case you do not possess either of these types you may be able to gage the temperature approximately by the color according to Pouillets chart given below:

Color	Deg. Cent.
Cherry red	900
Dull orange	1150
Bright orange	1200
White heat	1300
Dazzling white heat	1500

Q & A

Gives Rough Surface

QUESTION

We have an inquiry for 10,000 square feet of ⅜-inch cast iron plate to be used as flooring, and it must have a rough surface such as given by silicon carbide. Can you give us information how silicon carbide is placed in cast iron or other necessary data so that we can make these plates?

ANSWER

To obtain a silicon carbide surface on the floor plates it will be necessary to apply crystals of this material to the face of the mold which may be done in the following manner, which is claimed to be a proprietary process:

Make the mold in the regular manner and remove the cope and pattern. The face of the mold is then sprayed with a solution of silicate of soda or water glass in about six parts of water. The face of the mold then is sprinkled with silicon carbide and the pattern pressed back to insure a good casting. If thick, large crystals of silicon carbide may be used but if thin use finer crystals or they will not adhere to the iron. After removing the pattern, the mold face again is sprayed with silicate of soda, just enough to coat the carbide. Then the surface is dried with an oil torch to form a surface. Allow the surface to cool and sprinkle with powdered fluorspar. This with the sodium silicate forms a flux which causes a partial fusion of the silicon carbide and enables it to adhere to the wearing surface of the casting thus giving the desired result.

The mold is gated so that the metal will run over the full length of the face of the mold to an overflow head. The iron necessarily must be hot to have the carbide stick to the casting and give the required surface.

Q & A

Uses for Core Oils

QUESTION

We would like to obtain some detailed information on the various ingredients in core oil and a list of reputable manufacturers of this product. Can you give us any information on the application of fish oils and bone meal for tempering and annealing processes and whether animal and vegetable oils are used to any extent in the foundry or allied industries?

ANSWER

Core oil is composed of vegetable gums, gum rosins, imported fossil gums, light mineral oils and linseed oil. Some times other oils such as chinawood oil, corn oil and soyabean oil are used. In fact, any oil with good drying properties, high iodine and good film values are used. One concern that has many foundries in various cities uses a mixture or blend of linseed oil, crude oil and rosin, the entire mass being heated for some time to dissolve the rosin. A number of reputable manufacturers of core oils may be found in the advertising pages of THE FOUNDRY which will be glad to supply your wants.

We call your attention to an article, Core Oil Complex Compound by such as sperm, lard, linseed, cottonseed, whale, fish and paraffin oils are used in the tempering of steel. Raw bone and bone black or bone charcoal are used in the case hardening of steel springs, dies, cutters, etc.

We do not know of any other uses for these oils outside of those mentioned above in the iron and steel industry. Tallow is used in tinning operations.

Q & A

Small Variation Allowed

QUESTION

We have been having some discussion on the amount of variation which would be permitted in the analysis of gray cast iron for total carbon, manganese, phosphorus, sulphur and silicon between different laboratories on the same sample which had been moistened carefully with alcohol and quartered in the usual way. The variation to be considered is not that between two scientists working on the same sample, but the results expected in a commercial laboratory in routine work with good technique and personnel.

ANSWER

After some little search for authoritative information on your inquiry as to the variation allowed in analyses of cast iron between different chemists, we regret to say that there seems to be nothing definite on the subject. Personal experience in various laboratories shows the following allowances are made:

Element	Per Cent
Silicon	0.05
Sulphur	0.003
Phosphorus	0.02
Manganese	0.02
Combined carbon	0.02
Total carbon	0.04

For steel the American Society for Testing Materials gives the following variations:

Carbon by direct combustion $\pm$ [0.01 + (0.02 $\times$ the percentage of carbon found)].

Manganese, arsenite titration $\pm$ [0.01 + (0.02 $\times$ the percentage of manganese found)].

Phosphorus $\pm$ [0.002 + (0.02 $\times$ the percentage of phosphorus found)].

Silicon $\pm$ [0.005 + (0.02 $\times$ the percentage of silicon found)].

These variations hold to narrow limits as you well can see and would require exact analysis. Perhaps it would be a good plan to write to the chief chemists or metallurgists of some of the larger plants maintaining several laboratories and obtain their opinions on this subject.

The FOUNDRY Family Photograph Album

Upper Left

H. D. GATES

Pangborn Corp., Hagerstown, Md.

Lower Left

HUGH MARTIN

Detroit Gray Iron Foundry Co., Detroit

Upper Right

EARL SPARKS

Philadelphia Foundrymen's association, Philadelphia

Lower Right

F. S. WELLMAN

Wellman Bronze Co., Cleveland

SCRAP METAL SPECIFICATIONS

(*Continued from Data Sheet No.* 758)

No. 2 Cast-Iron Scrap

No. 2 cast-iron scrap will contain all kinds of agricultural implements of cast iron, free from steel parts, nothing under 10 pounds or over 500 pounds in weight nor over 48 inches long or 18 inches wide. To contain no stove scrap or burnt iron of any description.

No. 3 Cast-Iron Scrap

No. 3 cast-iron scrap will consist of cast-iron scrap with steel parts attached, nothing under 10 pounds or over 500 pounds in weight nor over 48 inches long or 18 inches wide.

Heavy Breakable Cast Scrap

Heavy breakable cast scrap will consist of heavy cast iron suitable for breaking under and with buyer's drop. Pieces not to exceed 10 tons in weight. Free from anvil blocks, hammer bases, and like material, over charging box size and containing no burnt iron.

LOW PHOSPHORUS AND LOW SULPHUR STEEL SCRAP FOR USE IN THE ACID OPEN-HEARTH FURNACES

Billet and Bar Crops

Billet and bar crops will consist of billet, bloom, axle, heavy forge, or bar crops containing not over 0.04 per cent phosphorus or sulphur, not over 0.50 per cent silicon, free from alloys. Not less than 2 inches square or diameter, not over 18 inches wide and sheared to lengths not over 36 inches. No piece to weigh less than 10 pounds nor more than 500 pounds. Must be new material and free from excessive rust. Longer lengths may be allowed by mutual agreement between buyer and seller.

Plate Crops

Plate crops, or sheet bar crops containing not over 0.04 per cent phosphorus or sulphur, not over 0.50 per cent silicon, free from alloys. Not less than ¼-inch thick, not over 18 inches wide and sheared to lengths not over 36 inches. No piece to weigh less than 10 pounds or more than 350 pounds. To be free from needle and sliver stock. Must be new material and free from excessive rust. Longer lengths may be allowed by mutual agreement between buyer and seller.

(*Continued on Data Sheet No.* 760)

SCRAP METAL SPECIFICATIONS

(*Continued from Data Sheet No.* 759)

Structural and Miscellaneous Scrap

Structural and miscellaneous scrap will consist of bar ends, forging crops, structural crops, and plate shearings smaller and lighter than grade *A* and *B*, not over 0.50 per cent silicon, 0.04 per cent phosphorus, and 0.05 per cent sulphur, free from alloys. Not less than ¼-inch thick, not over 18 inches wide or 36 inches long. To be described fully at time of sale and purchase. Must be clean and free from excessive rust. Longer lengths may be allowed by mutual agreement between buyer and seller.

Tube Scrap

Tube scrap, seamless or welded, will contain not over 0.04 per cent phosphorus or sulphur, free from alloys. Not less than No. 12 gage thickness of wall; if over 6 inches inside diameter they must be mashed flat and sheared to lengths not over 36 inches. Must be only new material that has not been in use for any purpose and free from excessive rust.

Punchings

Punchings from plate and structural steel scrap will be not less than ¼-inch thick and not less than ½-inch in diameter, containing not over 0.04 per cent phosphorus or 0.05 per cent sulphur, not over 0.50 per cent silicon, free from alloys. Must be free from dirt and excessive rust or corrosion.

Car Wheels

Car wheels will consist of solid cast steel, forged, pressed or rolled steel car and locomotive wheels, not over 36 inches diameter. (Specify kind when offering.)

Spring Steel Scrap

Spring steel scrap will consist of coil and elliptic steel springs, made of material not less than ⅜-inch diameter or ¼-inch thickness, not over 18 inches wide and sheared to lengths not over 48 inches. May be assembled or cut apart.

Couplers and Knuckles

Couplers and knuckles will consist of railroad car and locomotive steel couplers, knuckles and locks, stripped clean of all other attachments. Gates, heads and risers may be included by mutual agreement between buyer and seller.

Scrap Tires

Scrap tires will consist of steel tires from car and locomotive wheels, cut to not over 24 inches long.

(*Continued on Data Sheet No.* 761)

THE FOUNDRY DATA SHEET, APRIL 1, 1929

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

How and Why in Brass Founding

By Charles Vickers

Makes Art Castings

We have tried to make art castings in bronze but so far with little success. The patterns have been carved from beeswax and represent deer and other animals, and due to their shape there can be no parting line. The deer are about 3 inches high and have 5-point horns, with legs about the thickness of a match making them delicate to handle. We have tried several methods of molding, such as packing the patterns in core sand then baking the mold to drive out the wax, but the latter melts and softens the core, so that it does not retain its shape when it is being baked hard. We have also used a graphite composition such as dentists use for molding gold and silver teeth, but this also has failed. We will value your suggestions.

In the Sept. 15, 1925 issue of THE FOUNDRY a description of an interesting method of producing such castings as those mentioned in the query is described. If access can be had to the Feb. 1911 issue of THE FOUNDRY a very complete and copiously illustrated article will be found on pages 263-268 inclusive. Briefly, however, we can state that the molding medium usually employed is a mixture of finely powdered red brick and plaster of paris. The brick dust opens up the plaster and renders it more refractory. The writer, however has had good success with a mixture of finely screened carborundum firesand and plaster of paris. The latter gives the self setting bond and is used in various proportions, but it would be advisable first to try the following mixture: One part plaster of paris, 2 parts brickdust and water sufficient to moisten. Shredded asbestos mixed in will tie the mold together so if it cracks in drying it will not break to pieces.

Small statues as described in the query no doubt will be cast solid which will simplify the gating system. The gates should be attached and should consist of wax like the pattern so that when the wax is melted out of the mold there will be a free passage for the molten metal to fill up the mold. To make the mold the pattern can be suspended in a suitable vessel in such a way that the plaster mixture can be cast around it. With some odd shaped objects it is necessary first to cast a foundation, or drag part, on which the mold can stand. Then sides are built around it so the plaster can be poured in. Sharp points like the horns of deer will not be likely to run up completely unless a thin string of wax is attached to them leading outside the mold to vent off the air. Much ingenuity can be expended in venting and gating to make more certain the production of perfect castings. After the mold has been cast and has hardened, it can be trimmed to expose the gating system openings, and at the start it might be wound around with thin wire to hold it together in case of rough handling.

Melt out as much of the wax as possible using a gentle heat at first. Wax refusing to flow out must be burnt out, so the mold will have to be brought to a red heat, which is done slowly. One way of pouring such a mold is to first plug up all openings with putty, and then mold the mold in a two-part flask. A sprue is molded or cut in the sand of the cope of this second mold as usual, the first mold pattern is removed and the plugs of putty are removed. Vents are made through the sand of the enclosing mold and gates are cut to the gate system of the small mold. The first mold is replaced while warm and the cope closed over. The double mold is poured in the ordinary manner.

Valve Metal Leaks

We would like to get a formula of brass to be used in oil wells which when cast into valves must withstand an air test of from 300 *to* 1000 *pounds per square inch. We can make valves having a tensile strength of* 25,000 *pounds per square inch which do not leak at the pressures mentioned above, but the new valves must also possess a tensile strength of* 60,000 *pounds per square inch, in addition to being tight, and although we can get* 60,000 *pounds tensile in a metal, the castings all leak. Can you give us such an alloy?*

Aluminum bronze would meet the requirements, and we suggest the alloy containing aluminum, 10 per cent; iron, 4 per cent, and copper, 86 per cent. This alloy also will withstand the pressures given although considerable practice might be required to get the knack of casting it. It is being used extensively for pressure castings now, although at one time it was not believed possible. Monel metal is another alloy that will meet the requirements stated in the query. This alloy is not as easy to cast as the red metals, but the difficulties encountered can be surmounted. No gun metal or red brass can be made that will consistently meet the requirements of tensile strength and imperviousness to air pressures, therefore it will be necessary to experiment with some of the difficult-to-cast alloys.

Alloy Contains Nickel

Kindly inform us what composes aterite metal. Has it any expansion qualities, or is it of a brittle character when cast?

Aterite is a name covering a multitude of alloys with varying proportions of copper and nickel and other metals such as iron, zinc, tin and lead. Naturally the physical properties of aterite vary with the composition. There is no reason why any of the alloys should be brittle, as they possess a measure of ductility although undoubtedly there are alloys much superior in this respect. Aterite alloys are supposed to be resistant to corrosion. However, they have not maintained always their reputation in this respect. One of the best of the series of alloys which contained 35 per cent nickel, 40 per cent copper, 5 per cent lead, 15 per cent iron, and 1.5 per cent zinc was beaten by all the alloys it was compared with. Even commercial bronze was much better according to Robert E. Wilson and W. H. Bahlke, *Industrial & Engineering Chemistry*, April, 1925. Another aterite alloy consists of 66.75 per cent copper; 17.25 per cent zinc; 13.92 per cent nickel; 1.58 per cent iron; 0.18 per cent lead; 0.23 per cent manganese and 0.17 per cent aluminum. There are other alloys containing still lower percentages of nickel than 14 per cent; one alloy contains only 9 per cent nickel.

Melting Iron in the Cupola

Part XV

By J.E.Hurst

IN THE recent Poumay arrangement, British patent No. 232630, the auxiliary tuyeres are arranged in spiral fashion, directly and individually connected to the main wind belt with a regulating valve to each tuyere. Special form of tuyere in the upper of the two normal rows also special form of the two principal rows of tuyeres are illustrated in Fig. 100.

According to Kirk claim of saving at least 20 per cent fuel was made for the Greiner cupola. In some instances it was stated that the fuel saving reached 40 and even 50 per cent. At one time, over three hundred of these cupolas were in use in Europe.

Claims for the Poumay system include the ability to melt high phosphorus iron with 6 per cent of melting coke against 9 to 14 per cent used in ordinary practice, and to melt hematite with 8 per cent against the usual 12 to 18 per cent. The owners claim to be able to melt all steel charges with 12 per cent of melting coke, to invariably obtain hot metal, diminished losses in silicon, manganese and total metal and a diminution in the carbon pick-up. The Poumay principle can be applied to existing cupolas or incorporated in new cupolas to deal with specified outputs.

Proponents for all these systems of secondary air injection claim that their economy is due to the combustion of carbon monoxide at the higher levels of the cupola by the aid of this secondary air. Heat generated by secondary combustion is communicated to the charge which thus is melted with a lower total coke consumption, it is claimed.

Before referring further to types of special cupolas a brief consideration of economical possibilities arising out of the use of hot blast or secondary air injection may be useful. This has been considered partially in previous chapters.

Hot blast and secondary air injected with the object of burning the CO *in situ* are the only two methods which have been tried for recovering or partially recovering sensible and latent heat carried away by outgoing gases in normal standard cupola practice. Whether any of this heat actually is recovered by these various methods unfortunately has not been demonstrated clearly in every instance. For that reason the theories underlying the various proposals are still the subject of much controversy. The only method of forming a just estimate of economy directly resulting from application of hot blast or secondary air is by a strict comparison of the overall thermal efficiency of these special cupolas with the best thermal efficiencies obtainable with normal types and operation.

Comparison of coke ratios only, without reference to ash content, molten metal temperature, temperature and composition of the outgoing gases is insufficient. Authenticity of some of the coke ratios obtained or claimed for these special cupolas often is subject to grave suspicion.

In England where this is written, some of the best ratios obtained are no better than can be obtained in the best normal practice under similar conditions of melting temperature and ash content. Low coke ratios appear to be possible from scientific determination of the most economical conditions in standard cupolas. The fact that coke charges in many foundries still are left to the personal judgment of the cupola attendant raises the question at once, "Are our coke ratios too high?" Conceivably even today, careful analysis of normal cupola practice will be repaid by a still further saving in coke.

Theory of thermal economy by the injection of secondary air through auxiliary tuyeres rests on a fallacious basis. Possibility of burning CO to CO_2 in this manner is undoubted, but this conversion is accompanied immediately by an increase in temperature to such an extent that the CO is reformed at the still higher levels. This was the author's experience with the arrangement previously illustrated. Operation with a lower coke consumption than normal, was accompanied by a lower metal temperature and melting rate. So far as the author is aware, determination of the thermal efficiency of a cupola operating with secondary air tuyeres never has been made.

Improve the Blast

AUXILIARY tuyeres for regulation of the blast and for utilization of either cold blast or a blast that has been preheated in some manner have been tried out to a considerable extent. Claim for a marked reduction in fuel has been advanced as a result. Up to the present the exponents of hot blast have confined their efforts to cupolas running on long heats. Powdered coal has been tried as an auxiliary fuel in cupola operation and recent experiments also have been carried on with oil used for the same purpose. Oil-fired furnaces have been employed in an effort to refine molten iron. Published reports indicate that considerable economies have been effected through the practice of auxiliary firing.

Table XVI

Leading Dimensions

Inner diameter of the furnace, ft....	2.95
Area of the furnace, sq. ft.....	6.85
Total height of the stack, ft.	19.36
Number of blast tuyeres	4
Area of blast tuyeres 1.21 X 0.59 ft. = sq. ft.	0.71
Total area of blast tuyeres, sq. ft.....	2.84
Distance between tuyere level and hearth level, ft	4.13
Active height of the furnace, ft.....	15.22
Active height of furnace / Diameter of furnace	5.15
Area of blast tuyeres / Area of furnace ....(1:2.4)	0.42
Number of powder tuyeres	3
Area of powder tuyere 0.69 X 0.39 ft. = sq. ft	0.269
Total area of powder tuyeres, sq. ft.	0.807

Possibilities of hot blast are restricted by the intermittent working of the majority of cupolas. Any cupola designed for hot blast operation must operate as a cold blast cupola for a portion of its run. Possibility of economy under such conditions will be influenced to a great extent by the proportion of time in which the hot blast is operating under optimum conditions. Any improvement in thermal efficiency ultimately must be considered on an economic basis and only can be justified if the saving resulting from increase in efficiency is greater than the costs incurred in obtaining it. Probably many of the hot blast arrangements result in improved thermal efficiency under favorable circumstances, but up to the present, increased capital costs and increased maintenance costs have been too great to justify their continual use.

Other attempts to improve cupola economy differ from the foregoing. Instead of trying to recover the waste heat, the object is to reinforce the heat generated in the normal combustion zone. To obtain a larger evolution of heat per unit volume of combustion zone, or alternatively per unit of cross-sectional area of the cupola.

One of these methods depends on utilization of auxiliary powdered coal firing. A series of tests by Bordenheuer have been published in *Stahl und Eisen* 1927, page 1389, on the method introduced by Kaiser. In this process powdered coal to the extent of 0:8 to 1.0 per cent by weight of the iron charge, is injected through auxiliary tuyeres into the cupola by compressed air.

Dimensions of the cupola studied are given in Table XVI.

Distance Is Important

Distance of the coal powder tuyeres above the level of the blast tuyeres is of great importance. Where the distance is too great, CO forms for want of oxygen. Moreover, part of the powdered coal unburned escapes through the stack. If the distance is too small, the furnace output is lowered and the temperature of the iron remains unchanged. Best distance between the two levels for a cupola with an inside diameter of 2.95 feet, is 6.69 inches. Three powder tuyeres are provided and the pressure of the air is from 36 to 42 pounds per square inch. Inner diameter of the air pipe line is 1.5 inches. Blast pressure in the main tuyeres is held low between 2.95 to 4.53 inches of water. Thermal efficiencies, metal temperature, and other data obtained by Bardenheuer in his tests are shown in Table XVII.

Auxiliary oil firing appears to have been suggested first by Bradley Stoughton, New York, and a description of equipment and process appeared in THE FOUNDRY, 1915.

Owing to the great scarcity of coke in Austria, experiments were undertaken to ascertain whether oil could be used in cupola melting. These experiments are described by Berthold in *Stahl und Eisen*, March 24, 1921. Three oil burners were used, and the number of tuyeres reduced to three. Somewhat less than the usual bed coke was charged, and the charge coke continued at 4 to 5 per cent. Oil consumption amounted to 1 per cent of the metal melted. Rate of melting increased 30 to 50 per cent, and the metal temperature remained unaltered.

Quite a new departure is embodied in the British patents No. 184479 and 183418 of the Vulkan-Werk of Duren. In this arrangement provision is made for a water spray, either above or below the tuyere level. Advantages claimed for this arrangement include hotter iron, reduced coke consumption, low sulphur content, and extension to

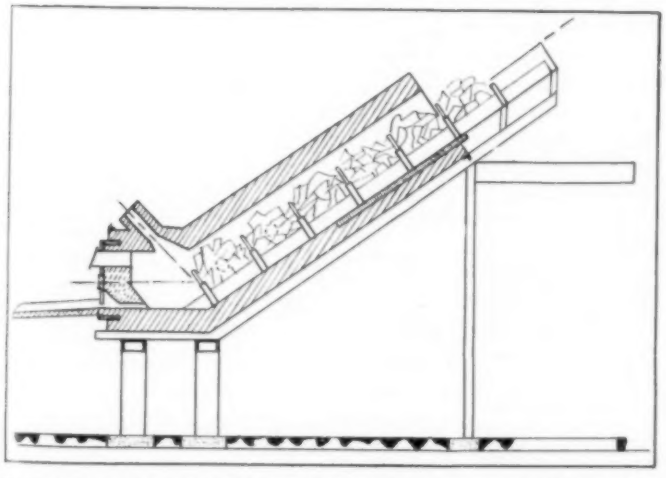


FIG. 99—INCLINED CUPOLA INVENTED BY L. J. ROCHLITZ FOR OPERATION WITH LIQUID OR GASEOUS FUEL

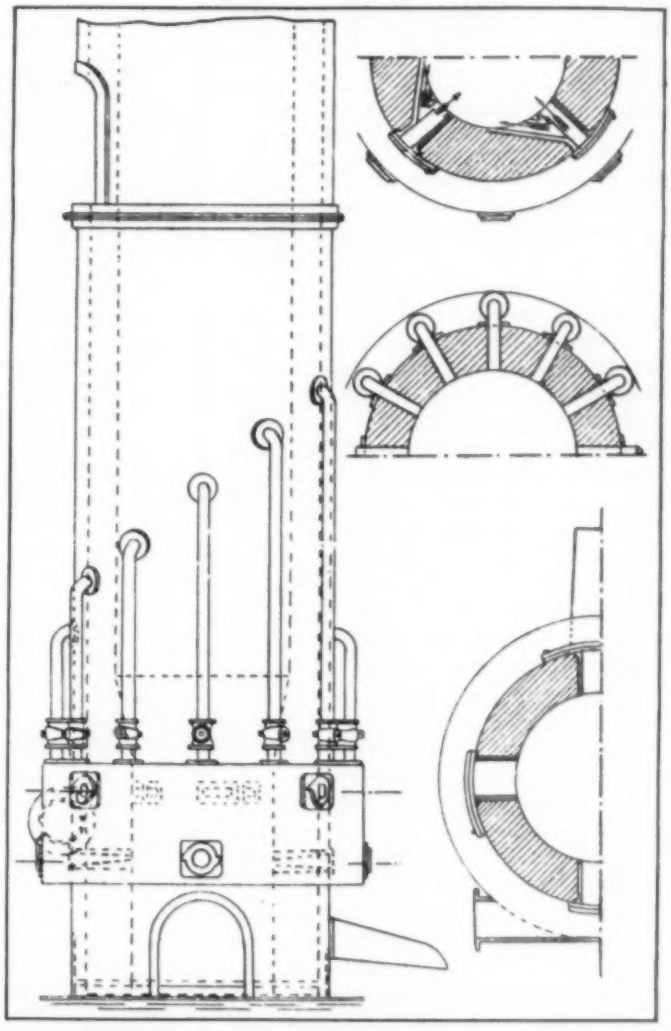


FIG. 100—POUMAY SYSTEM OF SECONDARY AIR INJECTION THROUGH SPIRAL ROW OF SMALL OPENINGS

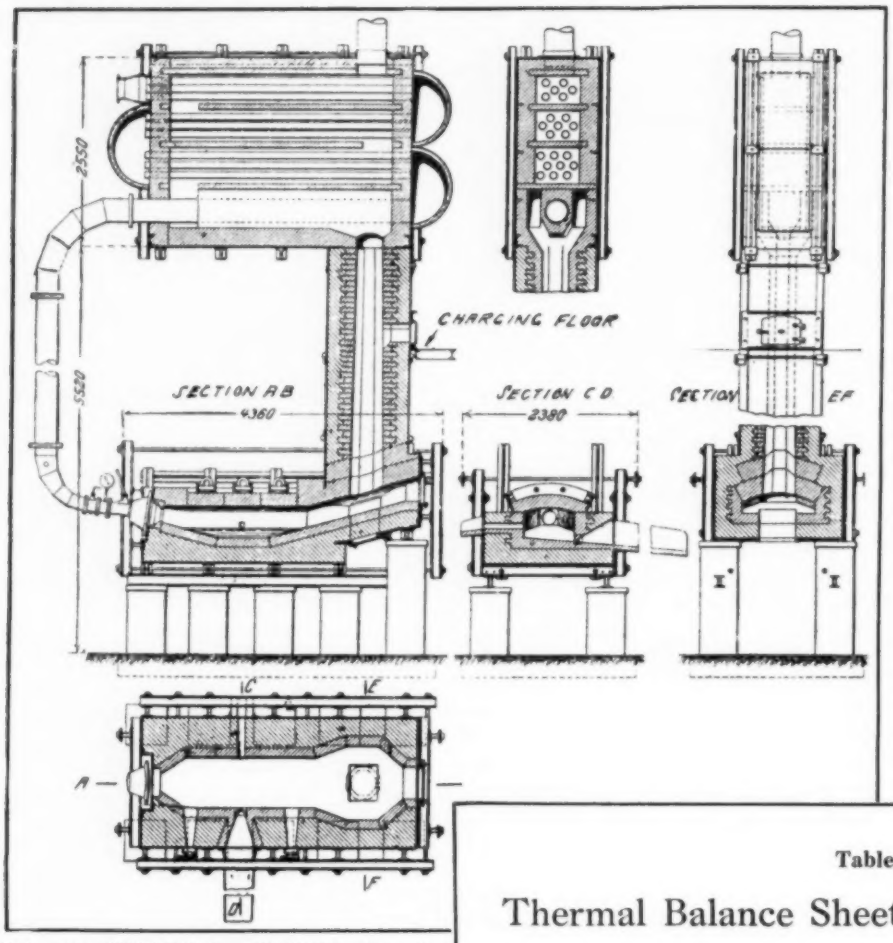


FIG. 101—SECTIONAL DRAWING OF A WUEST OIL-FIRED CUPOLA

the life of the lining of the cupola.

The Wuest oil fired refining furnace is described alternatively as a reverberatory or oil fired cupola furnace. Since the design includes a shaft in which cast iron is remelted, this furnace legitimately may be classified as a cupola furnace, although coke is not used as fuel. This furnace can be worked continuously like a cupola. Refined irons and irons of low total carbon content can be produced with certainty and with uniformity.

To some extent this special furnace resembles the duplex plant of a cupola and electric furnace which admittedly is the ideal type of plant in which to attain the special results mentioned. It is claimed for this plant that the results equal an electric furnace installation, but that this plant operating on oil fuel, obviates the expense of electric current.

Construction of the furnace is shown in Fig. 101. A reverberatory furnace hearth leads to a refractory lined shaft provided with a charging door at a higher level, exactly as in a normal cupola, and clearly shown in the section *E-F*. Continuation of the refractory lined shaft leads the hot gases into a preheating device in which escaping heat is utilized to preheat the air for the oil burners. The preheater, clearly illustrated, consists of a large brick chamber, divided into four smaller chambers by refractory baffle floors arranged in a labyrinth. Air for the oil burners is led through a series of tubes, in the top chamber and extending through one end wall into a domed connecting passage to a series of similar tubes carried in the chamber immediately below. From this chamber, the incoming air is led through the successive remaining chambers and is carried by a lagged pipe to the main oil burner at *A*, erected at the front of the reverberatory hearth directly opposite the shaft exit. Section *C-D* shows a cross section of the furnace through the slag and metal spouts.

Flame developed by the oil burner first sweeps the bath, where it strikes against the lower part of the column in the charging shaft. Material melts and runs down into the hearth, while fresh material is charged above or delivered through the throat opening. Escaping gases sweep through a preheater and heat the blast air on the counter current system. Blast tem-

Table XVII

Thermal Balance Sheets of Coal Fired Cupola

	First experiment		Second experiment	
	Without auxiliary firing Calories	With auxiliary firing Calories	Without auxiliary firing Calories	With auxiliary firing Calories
In				
(*a*) Iron charge	52,650	53,940	76,860	79,650
(*b*) Coke charge dry	8,399	5,424	13,179	8,648
(*c*) Moisture of coke charge	4,953	3,448	3,762	1,896
(*d*) Coal powder dry	.....	827	.....	1,039
(*e*) Moisture of coal powder	.....	36	.....	25
(*f*) Limestone	3,510	3,147	5,103	3,524
(*g*) Blast dry: Oxygen	34,940	25,149	57,901	44,145
Nitrogen	128,670	91,187	213,442	162,734
(*h*) Pressed air dry	.....	2,967	.....	3,713
(*i*) Moisture of blast	1,918	1,383	4,210	4,808
(*k*) Moisture of pressed air	.....	33	.....	78
(*l*) Combustion of carbon to carbon dioxide	15,147,891	13,325,148	15,248,979	13,269,177
Carbon monoxide	2,901,526	1,275,193	3,302,345	1,667,252
(*m*) Formation of FeO	85,812	71,226	108,392	84,810
(*n*) Formation of Mn.O	73,360	71,377	61,723	62,599
(*o*) Formation of SiO_2	1,152,970	1,187,549	1,233,224	1,056,514
(*p*) Formation of P_2O_5	113,679	79,182	16,802	4,766
(*q*) Formation of SO_2	14,366	17,581	24,542	9,533
	19,724,608	16,218,797	20,370,464	16,464,911

	First experiment		Second experiment	
	Without auxiliary firing Calories	With auxiliary firing Calories	Without auxiliary firing Calories	With auxiliary firing Calories
Out				
(*a*) Molten iron	9,218,805	8,822,259	8,949,171	8,714,015
(*b*) Residual coke	60,048	74,311	53,480	60,655
(*c*) Slag	864,189	765,765	824,880	644,909
(*d*) Combustion gas: CO_2	1,152,119	1,009,565	1,154,424	986,024
CO	438,261	192,612	498,803	251,831
N_2	3,558,938	2,684,391	3,749,655	2,858,836
SO_2	1,296	1,586	2,214	860
(*e*) Evaporation of the charge coke moisture	330,192	214,002	161,208	75,825
(*f*) Evaporation of the coal powder moisture	.....	2,232	.....	981
(*g*) Dissociation of the limestone	533,775	445,498	504,292	324,989
(*h*) Loss	3,566,985	2,006,576	4,472,337	2,545,986
	19,724,608	16,218,797	20,370,464	16,464,911
Loss due to the formation of CO	6,730,589	2,958,029	7,658,357	3,867,478
Total heat income when combustion is complete	26,454,497	19,176,826	28,028,821	20,332,389
Burnt carbon from the fuel, kg	3,075.94	2,146.74	3,178.59	2,251.88
Heat income from the carbon when combustion is complete	24,915,114	17,388,594	25,746,579	18,240,288

peratures, it is claimed, rise to 400 degrees Cent. and at times even to 600 degrees Cent. Slag flows from the side opposite the tap-hole. The shaft is easily accessible through a flap on the charging floor. Necessary repairs can be carried out quickly and conveniently through removable covers in the floor arch.

As in the cupola furnace, the charge is delivered from the charging stage with an addition of 1 to 2 per cent of limestone. No coke is necessary. Coal tar oil, with a value of about 9200 calories is used as fuel, and the temperature of the iron tapped out is between 1500 and 1600 degrees Cent.

Figures in the accompanying table also give particulars regarding efficiency of the furnace on a special charge with a melting point of about 1260 degrees Cent. These figures show low oil consumption and hourly output of a furnace which, of course, also can be built for larger outputs.

Total charge, kg.	4,500	4,200	4,000
Total charge, lb.	9,900	9,240	8,800
Output per hr., kg.....	1,125	1,050	1,020
Output per hr., lb.	2,475	2,310	2,244
Oil consumption in preheating	1.1%	1.6%	0.87%
Oil consumption in melting	6.9%	8.7%	8.9%
Total oil consumption....	8.0%	10.3%	9.8%

Grey cast iron melted by this method presents a low sulphur content, finer graphite separation, and the possibility of obtaining with accuracy a uniformly low carbon content of the particular analysis desired.

Another special form of cupola for operation with either liquid or gaseous fuel designed by Rochlitz (U. S. A. patent No. 1,476,106) is illustrated in Fig. 99. The shaft is inclined at an angle and the successive charges are carried in containers. Each charge may be melted separately and the patent specification describes a number of methods of controlling the movements of the charge.

Apprentices Banqueted

The sixth annual banquet for apprentices in the last year of their contract and for prize winners in the various trade contests held during the year by the Milwaukee branch of the National Metal Trades association was held Feb. 18 in the new dining room of the Milwaukee Vocational school. Approximately 450 executives, officials and apprentices attended. Harold S. Falk, chairman of the Metal Trades apprenticeship committee, presided at the dinner and distributed the prizes. Following the distribution of the awards, Robert L. Cooley, director of vocational Education in Milwaukee and president of the American Vocational association, spoke on "Oiling the Social Machinery."

Appoints Committee

Gray Iron institute has appointed the trade practice committee which will be composed of the following members: Ralph M. Hill, East St. Louis Casting Co., East St. Louis, Ill., chairman; Thomas W. Pangborn, Pangborn Corp., Hagerstown, Md.; Chester A. Peebles, Stedman's Foundry & Machine Works, Aurora, Ill.; E. L. Wieland, Milwaukee Gray Iron Foundry Co., Milwaukee; W. J. Maton, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. This committee will serve as a subcommittee of the merchandising committee of which Don McDaniel, Hamilton Foundry & Machine Co., Hamilton, O., is chairman. R. D. Phelps, Francis & Nygren Foundry, Chicago, has been added to the personnel of the research committee. The series of meetings addressed by A. J. Tuscany, manager of the institute, included the Newark Foundrymen's association, Downtown club, Newark, N. J., March 15, and the New York Gray Iron club, 2 Park avenue, New York, March 18. These meetings are held to acquaint the gray iron foundrymen of the country with the work of the institute.

Book Review

Proceedings of the American Society for Testing Materials, 1928, published in two parts, 6 x 9 inches. Part I contains 1184 pages and Part II contains 904 pages, bound in paper, cloth, or half leather, published by the American Society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY, Cleveland, each part, for $6 in paper, $6.50 in cloth, and $8 in half leather. In London each part may be obtained from the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster, for 30s, 37s 6d, and 40s respectively.

Each year the American Society for Testing Materials publishes its *Proceedings* which presents in permanent form the papers, discussions, reports of committees and officers, etc., that were presented at the annual meeting. Part I contains the reports of 42 standing and research committees and 3 joint committees of the society. These include reports of the committees on ferrous metals, nonferrous metals, effect of temperature on the properties of ferrous metals, cement, ceramics, coal and coke, etc. This volume also includes 81 tentative standards which have been revised or are published for the first time, the annual address of the president of the society and the annual report of the executive committee.

Part II contains 46 technical papers with discussions. The papers relate to investigations in engineering materials and include research problems in the fatigue of metals, effect of temperature on the properties of metals and corrosion-fatigue of metals. Other papers deal with cement and concrete, bituminous mixtures, rubber, etc. A number of papers describe the testing of materials and include the descriptions of new testing apparatus used in the work. Much data is included on both the work done and the apparatus used.

Company Changes Name

Cutler-Hammer Mfg. Co., Milwaukee, has changed its name to Cutler-Hammer, Inc. The company also has changed its incorporation from the state of Wisconsin to the state of Delaware and has included in the new company the Cutler-Hammer Mfg. Co., Milwaukee, The Cream City Foundry Co., Milwaukee, and Cutler-Hammer Mfg. Co., New York. The officers of the new company are: F. R. Bacon, chairman of the board of directors; B. L. Worden, president; F. L. Pierce and J. C. Wilson, vice presidents; H. F. Vogt, treasurer and W. C. Stevens, secretary. The directors are: F. R. Bacon, Milwaukee; F. L. Pierce, Milwaukee; B. L. Worden, West Orange, N. J.; Carl A. Johnson, Madison, Wis.; T. Johnson Ward, New York; L. A. Lecher, Milwaukee.

Sells Sand Equipment

Royer Foundry & Machine Co., Wilkes-Barre, Pa., has sold sand separators to the Albany Car Wheel Co., Albany, N. Y.; Almont Mfg. Co., Imlay City, Mich.; American Foundry Co., Los Angeles; Bauer Bros Co., Springfield, O.; Buffalo Forge Co., Buffalo; Burgess-Parr Co., Moline, Ill.; Canton Malleable Iron Co., Canton, O.; Electric Auto-Lite Co., Fostoria, O.; Fisher Brass Co., Marysville, O.; Frontier Iron Works, Buffalo; Gluntz Brass Foundry Co., Cleveland; Macaulay Foundry Co., Berkeley, Calif.; Matthews Steel Casting Co., Cleveland; Nevada Consolidated Copper Co., McGill, Nev.; Ohio Injector Co., Wadsworth, O.; Pratt & Letchworth Co., Buffalo; Western Foundry Co., Chicago.

Grinding Aluminum Pans

Question: Can you furnish us with some information pertaining to the machining, grinding or cleaning of such articles as frying pans made of cast aluminum and other cast kitchen utensils?

Answer: In some instances alumi-

num hollow ware is finished on a so-called hollow ware grinder. In finishing skillets, they are located in a chuck and rotated at an approximate speed of 60 revolutions per minute, while the grinding is accomplished with a special shaped wheel called a skillet wheel, run at an approximate peripheral travel of 5000 feet per minute. The abrasive used is carbide of silicon, 30 to 36 grit, in a medium hard grade. After the first grinding operation a setup polishing wheel is sometimes substituted for the skillet wheel. This wheel is set up with 60 grit abrasive, emery or manufactured alumina. Operations with wheels set up with 90 and 120 grit material follow. The last operation can be performed with a greased wheel. In some instances the polishing operations are performed by hand. The object of this procedure is to obtain the high peripheral travel necessary to make the polishing wheel operate effectively, say 7000 to 9000 surface feet per minute. It is not always practicable to attain this speed on the hollow ware grinder. Local conditions govern these operations to a great extent; so that it is often necessary to experiment with various grits and grades of wheels, and various numbers of abrasives used for finishing, to determine which will give the most efficient results.

Left to right: William Frew Long, S. D. Wright, William H. Shilling, W. L. Seelbach, H. L. Briggs, M. D. Jones, John E. Fintz

Cleveland Extends Apprentice Course

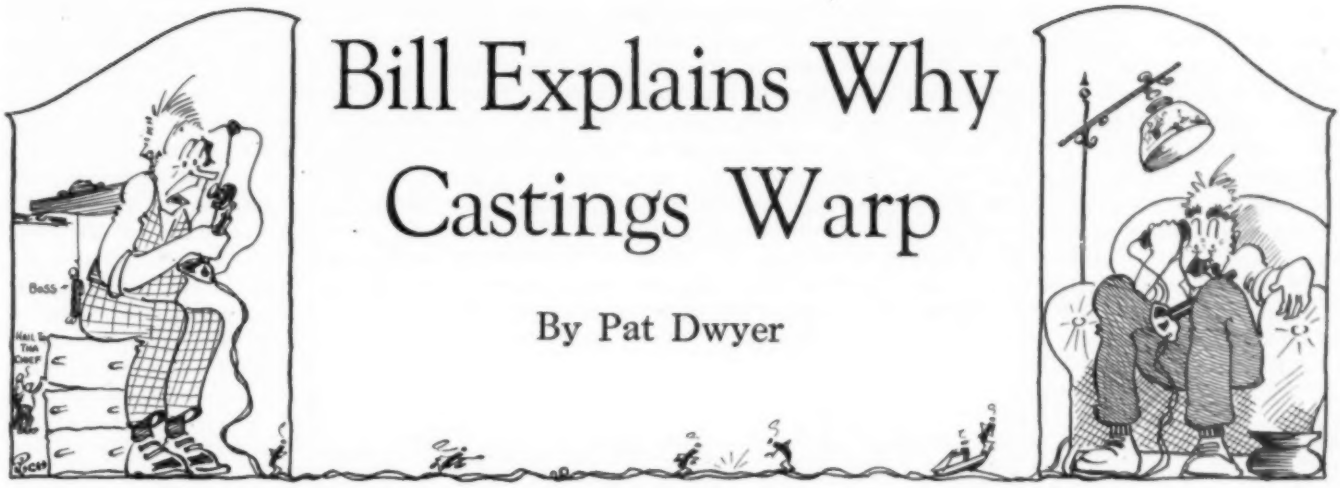
INDUSTRIAL vocational training has proved so successful in Cleveland that the work is to be extended with a well-equipped foundry. With this in operation in June, 1929, the Cleveland Trade school will be training students in 11 trades, including foundry practice, machine shop practice, automotive mechanics, sheet metal work, plumbing, electricity, carpentry, paper hanging, painting, bricklaying and stone cutting.

The completion of the new school will be the result of three years' co-operative effort on the part of representatives of the foundrymen of Cleveland and the board of education. The board observing the progress made in other vocational lines, finally authorized the expenditure of $45,961 for the foundry building, and it is to be equipped by the interested men of the foundry group.

Ground was broken for the foundry school March 6, adjoining the present vocational training school. Representatives of the board of education and the foundry division of an employers' organization watched William H. Shilling, superintendent, Atlas Foundry Co., and chairman of the organization foundry apprenticeship committee, turn the first shovelful of earth. The school board was represented by M. D. Jones, principal of the trade school; John E. Fintz, co-ordinator, and H. L. Biggs, director, department of vocational education. Those present from the employers organization were: S. D. Wright, president of the group, and vice president, Atlas Car & Mfg. Co.; William Frew Long, general manager of the organization; W. L. Seelbach, treasurer of the organization, chairman of the general foundry group, and secretary-treasurer, Forest City-Walworth Run Foundries Co.

The foundry apprentice committee appointed to work with the school board in conducting the foundry school consists of the following: W. H. Shilling; Tracy Calhoun, the Johnston & Jennings Co.; George Hammink, the Wellman Bronze Co.; F. J. Grondie, the Kilby Mfg. Co.; W. J. Strangward, the Forest City-Walworth Run Foundries Co., and Daniel Gluntz, the Gluntz Brass Foundry Co.

An additional committee, charged with securing the equipment for the school, consists of J. W. Strangward, chairman; F. N. Lansdowne, the West Steel Castings Co.; Daniel Gluntz and A. H. Chappelka, the Lake City Malleable Co.



Bill Explains Why Castings Warp

By Pat Dwyer

SOME day when you have an hour to spare," Bill phoned with gentle sarcasm," stick on your hat and coat and take a run out here to see some of the changes in the old dump. Unless you drop into a foundry now and again and get a whiff of the real old atmosphere, inhale a gill or two of dust and get some sand in your shoes, you will pine away and wither like a plant—say a thistle or a burdock—under a half bushel basket."

Naturally, I resented the totally unwarranted and uncalled for comparison. Out of all the thousands of available plants I think he might have selected a pair more nearly representative, a violet, let us say, or a modest little primrose. He laughed coarsely when I filed this gentle and justifiable protest.

"A violet, hey?" he said, "you look about as much like a violet as I look like Brian Boru's pet necktie. If I had said a turnip or one of those things that go creeping all over the place—what d'ye call 'ems—pumpkins—I would have been nearer the mark. I did not want you to get all swelled up. However, that's neither here nor there, as Slick Mick told the gaffer when that nosey individual asked him where he had placed the chaplets on a length of scrap pipe. Are you coming out?"

I thanked Bill for his friendly invitation—with certain features properly censored, expunged and expurgated as noted—and admitted that in the main, his comments were based on a sound foundation.

To a person who has spent any considerable period in the foundry, the combined aroma in one of these establishments is as welcome and grateful as the salty tang from the wind-swept beaches is to the former coast dweller marooned for a long period in a far inland community. After a man has inhaled dust and grit for many years, his system becomes accustomed to it. He can get along without it—man is an adjustable kind of a beast—but a good whiff now and again serves as a tonic.

Part of a chicken's diet is grit and surely what is good for one of these lowly creatures should be equally acceptable to that noble creature, man. You never see a molder suffering from dyspepsia. That affliction overtakes him only after he has quit the sand heap and taken up a life of ease as the proprietor of a foundry.

After I had inspected Bill's place and admitted, reluctantly, that I had not seen a single feature on which I could suggest an improvement, we adjourned to his den and talked of many things including the coming convention in Chicago. Bill was looking forward with the keenest anticipation to meeting old and new cronies.

"Every convention I attend," he said, "I am sure to meet several lads whom I have not seen or heard from in years. They shift round, here, there and everywhere. Some men who were apprentices when I first knew them, now hold important positions in places far removed from the scene of their early activities and I am delighted to find in many instances I had noticed that they were what the Scotch call 'Lads o' pairts.'

"I met one of these boys at the convention in Philadelphia last year and learned that he had charge of a western foundry connected with a railroad. He told me something about his place and also touched lightly on his wanderings before he landed there. Most of our talk was concerned with the men and events connected with the old plant in which we had worked together. The personnel of that plant has changed many times in the intervening years. Some have fallen by the wayside, some have disappeared. Only in a comparatively small number of instances had we any knowledge of their present location. Finally he asked me if I remembered young Jimmy Gorman and when I said I certainly did, he told me that Jim now is superintendent of motive power on this western railroad and one of his neighbors. Then we both laughed at the recollection of Jim's application for a driver's job in the old plant. Jim

THERE ARE NO BOYS LIKE THE GOOD OLD BOYS

started as a wiper in the roundhouse of a steel and coal company which operated its own—what's the word—fleet?—of locomotives, wide and narrow gage,. and in due time was sent out as a fireman. First as an emergency or spare man and later as a regular man on one of the locomotives which shunted the empty and loaded cars on one of the ore piers.

"Big ore boats berthed alongside this pier. The ore was lifted by grab buckets, 15 or 20 tons at a bite and discharged into the waiting cars. Electrically operated mechanism on the pier spotted the cars in turn under the loading towers, but the locomotive was required to shift each string of loaded cars and replace it with a drag of empties.

"The track on the pier was level, but it climbed a fairly stiff grade before it joined the main line leading past the blast furnaces. Consequently, and this was particularly true on wet and frosty days, the driver had to exercise great care to keep his engine and load under control. A bumper was erected close to the outer end of the pier, but it was only designed to check a car traveling with slight momentum. A locomotive or string of heavily laden cars traveling at high, or even medium speed, certainly would smash through this slight impediment and jump into the water varying in depth from 35 to 40 feet, depending on the state of the tide.

"After serving a few years as a fireman, ambitious young Jim decided to apply for a job as driver. At the first favorable opportunity he invaded the chief's office and told old *C. C.* what he wanted. Of course the old man had a surname, but only a comparatively small number of people knew what it was. All over the plant he was known as *C. C.* I have no idea what these initials stood for, although at various times I have heard guesses ventured, that ranged all the way from *captain* to *cockeye*, from *caboose* to *calliope*, from *cheese* to *Comanche*.

"Men who for one reason or another had been separated from the payroll after a mutual exchange of personal opinions, seemed inclined to the idea that the first *C* stood for *cayenne*, *castor oil* or *carbolic acid*. Others stoutly protested that the name was *centipede*. The owner displayed the most uncanny ability to appear in several widely separated places almost at the same time. No man with two feet possibly could do it. He must have at least one hundred. Also he had a sting.

"He was an old-time railroader who knew his business from beginning to end, including alibis put up by drivers and train crews to explain their action or lack of action on any given occasion. He constantly wore a derby hat pulled low down over the eyes and when he sat in his office chair he cocked both feet on the desk.

DON'T FORGET THE WASTE AND THE OIL FEEDER

"All work train crews are tough and the toughness increases in direct ratio to the length of the train commencing with the driver and progressing regularly through the fireman, and conductor to the brakeman. They all left their toughness outside when they entered *C. C.'s* office either of their own volition or in response to one of the old boy's curt and characteristic invitations.

"One lad who had been through a hectic session summed the situation up rather neatly at a subsequent roundtable luncheon where several confreres sat around a salamander during a brief lull in activities.

"'So help me,' he declared earnestly, 'I'd sooner appear naked before my Maker to plead a case then face that foxy old devil sitting back on his hunkers in a squeaky swivel chair. He knows everything and everybody and you might just as well attempt to hide a flat wheel as to try to conceal certain information which you had considered exclusively your own. He glares at you from under the brim of his dip, asks you three or four questions an' he has ya turned inside out. He sure is hell on wheels. Double articulated, compound, mountain type, with a blinding head light and a siren that lifts ya off yer feet an' makes ya realize yer on'y a worm o' tha dust. Jis' a worm. Tha's all.'

"This was the man to whom Jim had to apply for a position as driver. The man who constituted his own examination board and whose decision was final on all points touching the operation of the traffic department. He did not conduct a written examination. Candidates who appeared before him either voluntarily or by invitation, were subjected to a brief oral examination.

"'So you want to be a driver, hey?' he said to Jim, 'Do you think you know enough about the job to cope with any emergency that might arise?'

"'That's a pretty wide question,' Jim replied. 'If I said *yes* you would set me down for a false alarm. If I answered *no* you probably would classify me as an amateur and a coward. I have not been railroading as long as you have, therefore I have not seen everything, but I have seen enough to convince me that I can make a fairly good stab at any emergency that may arise around this plant.'

"'All right,' said *C. C.* 'Suppose I gave you 29 and you found yourself on a dark, rainy night taking a drag of empties down to No. 1 pier. The load is a little heavier than usual. The rails are like a pair of greased skids in a shipyard. After you pass the hump beyond No. 1 furnace you begin to notice that you are slipping. What steps would you take to get the train under control and prevent it from jumping leap frog fashion into the harbor?'

"'I'd shut off the steam and sand the rails,' said Jim. 'If that did not slack her speed I'd try her with the air and if the brakes failed to hold her I'd reverse her, give 'er the steam and try to overcome the momentum of the moving train in that manner.'

"'Assuming that you had done all these things," *C. C.* persisted, 'assuming that you had employed steam, air and sand without success. If you found that the train instead of slacking speed, was steadily gaining momentum, what would you do then?'

"'Well,' Jim said, 'that is something that probably never will happen, but if I really found myself in the

position you outline, I'll tell you what I'd do. If I found myself on a runaway train and if I found that nothing would hold her, steam, air or sand, separately or in combination, I'd jump. That's what I'd do. I'd jump and let 'er go to hell!'

"I was reminded of this incident," Bill continued, "the other day when I had an inquiry from a foundryman who was having trouble with some of these long skinny castings that form door and window frames in buildings. He wrote that he had done everything possible to prevent them from warping, but still the castings were not straight. He had stripped the centers, pounded the sand down over the ends, left them in the molds all night and had tried a few in dry sand molds, but the results were the same. The castings came out of the sand with the ends cocked up. He wanted to know what he could do about it. My first impulse was to tell him that if he had done all these things and still the castings persisted in coming crooked, he had better chuck the job. There was nothing else left to do. However, on second thought I decided to read the letter over again, to see if I could discover anything between the lines that might serve as a clue in locating the trouble.

HA! CROOKED WOIK AT THE OLD CROSS ROADS

"He wrote that he was enclosing a sketch of a long, light, narrow, channel shaped casting, ⅜-inch thickness of metal, 8 inches wide, 8 feet in length which he could not cast straight. In some trials the ends were an inch out of line with the center. He had made several of these castings for door and window frames and in each instance had to straighten them, a costly process. He had tried making these castings with the face in the drag, also with the face in the cope, but the result was the same. He had rammed the sand down hard over the ends of the newly poured castings and had left the castings in the molds over night. He had stripped away the flask, put weights on each end of the casting and dug the sand from under the center. He had cambered the pattern in the opposite direction, but the casting came back. In fact he had done everything within his knowledge and experience, but had not been able to prevent the castings from warping. He even had tried the expedient of drying some of the molds. Metal was melted hot and poured through gates at both ends and in the center. The iron mixture conformed approximately to the following analysis: Silicon 2.00 per cent, sulphur 0.05 per cent, manganese 0.40 per cent, phosphorus 0.80 per cent.

"I wrote him that the composition of the iron is in no manner responsible for the crooked castings. The mixture outlined is quite satisfactory for the purpose and of course it must be melted and poured quite hot to run such thin sections 8 feet in length. The methods he tried for securing straight castings are those employed universally and I was at a loss to understand why he was not successful. A careful check on every step in the process of making, pouring and shaking out the mold would be required to determine the cause of the trouble. A possibility exists that the flask or bottom board is weak. The mold will strain under the pressure of the molten iron, particularly in the center. As a result the metal thickness in the center will exceed that at the ends and accentuate the difference in cooling time between these areas. Stripping the center should equalize the cooling speed between the center and the ends of a casting uniform in section, but manifestly it would be of little assistance on a casting where a thick center prolonged the cooling time beyond the normal period at that point.

"Under the conditions outlined, I assumed that he molded these castings singly in wood flasks. Unless these flasks are bolted or clamped across the center horizontally, they will spread, and a flask will yield a distorted casting. With a flat concrete or other form of artificial floor, the danger of a sagged bottom board is not great. With the ordinary jobbing shop sand or dirt floor, great care must be exercised to provide a level bed for the bottom board on one of these long flasks. Unless the board rests firmly and uniformly on the floor it will not support the sand in the drag properly and as a result part of the sand will sag. The casting in the sagged area will be thicker than it should be and naturally will complicate the cooling problem. Frequently on castings of this character, the sand on the inside of the pattern sags in the center after the drag is rolled over. This may be due to a weak board, insufficient clamping or to a bed that does not support the board properly. The pattern prevents the molder from noticing this type of sag. He draws the pattern and still may overlook this condition unless it is greatly exaggerated. If he is working piece work he will watch this feature closely, if not he will close a mold that really should be shaken out. A sag of $\frac{1}{16}$-inch may seem only a trifle, but it will cock up both ends of a casting that otherwise might remain straight.

"Stripping part of the casting, ramming the sand in the copes over the ends and the other preventive measures outlined usually are sufficient to hold the ends of these castings in place. However, no mention is made of the time these precautions were observed and I wondered if they were applied too late to be of any service. The castings are so thin that contraction begins almost the instant the last drop of iron has been poured into them. Therefore the necessary preventive measures must be applied almost immediately.

"The simplest and best way of stripping this particular casting to prevent it from rising at the ends, is to roll the entire mold over after the casting is poured. Remove the bottom board and strip the sand from the lower, or drag side of the casting for a distance of about 2 feet. After the first casting has been shaken out and cleaned he can see whether this has been too much or too little and govern himself accordingly on subsequent castings. After all, prevention of warped castings primarily is a problem that only can be solved by close observation based on experience. There is no ready made rule.

Foremen Should Cooperate

Time and Labor Saving Methods Frequently Are Developed Where Foundry and Patternshop Foremen Confer on Various Problems Before Work on the Pattern Is Started

By P. D. Forbes

PATTERNS made exactly to suit foundry requirements frequently are big cost reducers. Usually it is good practice to consult the foundryman, before proceeding with any pattern involving considerable molding. The molder's training usually does not give him the ability, of the patternmaker or draftsman in reading a blueprint and forming a picture from paper of exactly what kind of casting is required, but a conference between the patternmaker and the molder brings good results.

Where a pattern shop is operated in connection with a foundry, the foundryman can keep his eye on any unusual pattern under construction and check it before it reaches the sand. Where patterns arrive at the foundry, from different pattern shops that is where the trouble begins. Quite frequently, after a few castings have been made, the molder sees a cheaper and more convenient method of molding. On new work the draftsman, patternmaker and molder often can cut the costs by working together.

Fig. 1 shows three views of a box-like casting used in pulp mill operation. The casting weighs approximately 1350 pounds. The pattern for this casting, was made solid. A half corebox was provided to form the inside of the casting. The finished pattern is shown in Fig. 4. After a few had been made, the molder devised rather a clever scheme to speed up production. These castings usually are ordered in lots of 50 to 250.

Saves Time and Labor

A pattern was made exactly like the casting, except for a few minor core prints. This pattern left its own green sand core. A follow-board was built to the profile of *X Y* Fig. 1. The drag was filled and rammed on this follow-board, turned over, and then the follow-board was removed. In this manner an accurate seat for the bottom side of pattern was obtained. The pattern was mounted on this, and the cheek was placed in position. A 1-inch core print nailed on the open end held the fragile pattern together, and saved making a parting, when slab core was inserted. This pattern worked splendidly. Each casting required 10 hours molding time and 2 hours coremaking as compared with 13½ hours molding and 10 hours coremaking under the former method.

Total saving effected therefore was 11½ hours, per casting plus core sand, and the awkward job of pasting and placing the heavy core. The savings on 100 castings, therefore was 11½ x 100 = 1150 hours. Including the foundry overhead the saving amounted to approximately $1500.00.

Fig. 2 shows six more elaborate detail views of a casting used for a similar purpose. This casting, for a long time, had been made from pattern in halves, parted along line A-B. Inside of the mold was formed with a large dry sand core made in a half corebox and afterward pasted. A number of auxiliary coreboxes were required. This pattern had been in use for years. Records indicated that 210 hours pattern-making labor had been required on the job.

A new pattern designed to mold in the position shown and thus leave its own green sand core was made. The pattern complete with its coreboxes is shown in Fig. 6. Prints for the cored work on the ends are indicated by the dotted lines on the two views, Fig. 2. The pattern was jointed along lines *CD* and *EF* and savings

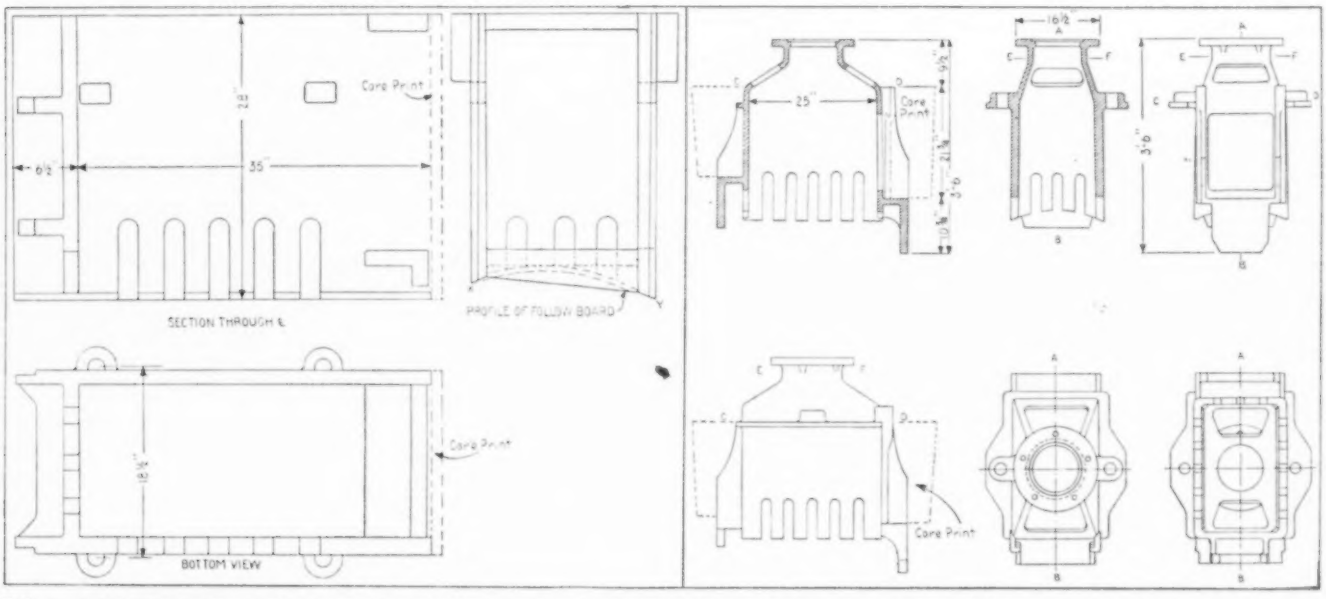
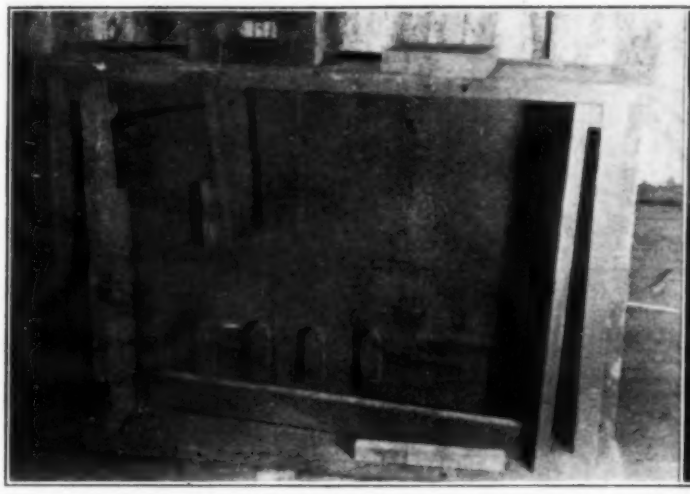


FIG. 1—A NEW PATTERN WAS BUILT TO LEAVE ITS OWN GREEN SAND CORE. FIG. 2—LEFT, PATTERN DESIGNED TO MOLD ON END. RIGHT OLD STYLE PATTERN EMPLOYING LARGE DRY SAND CORE



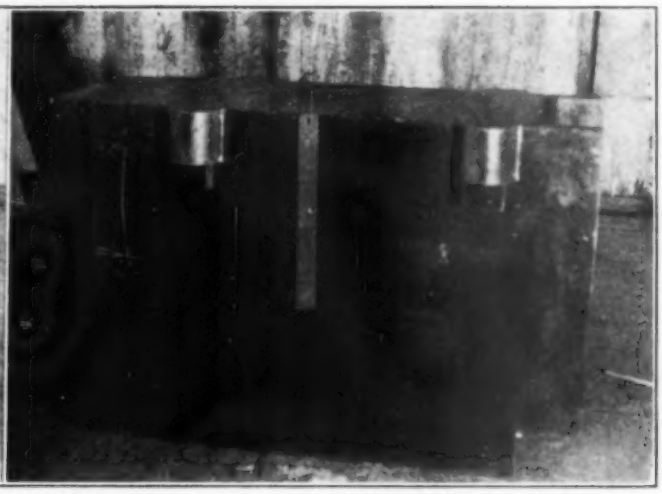


FIG. 3—COREBOX FORMERLY EMPLOYED TO FORM THE CASTING SHOWN IN FIG. 1. FIG. 4—PATTERN FORMERLY EMPLOYED FOR SAME PURPOSE

effected were somewhat similar to those cited in the other instance. The greater part of the coremaking was eliminated entirely. The pattern-making time was reduced to approximately half the time consumed in making the pattern shown to the right in Fig. 6. Savings like these certainly are worth while in this day of keen competition.

Celebrates Opening of New Foundry

More than 1000 guests witnessed the formal opening of the new foundry unit of the Detroit Gray Iron Foundry Co., Detroit, and the pouring of the first alloy steel heat at the plant of the Detroit Alloy Steel Co., March 16. Hugh Martin is president, and Harry H. Wyatt is secretary-treasurer of both firms. Kenneth L. Clark, sales manager, Norman Kluender, sales engineer and Thomas A. Moorman, metallurgist, assisted in the observance to which members of the Detroit Foundrymen's association and friends of the firm were invited. Late in the afternoon, a buffet luncheon was served in the restaurant of the new foundry unit. Music was supplied by one of Detroit's leading orchestras.

Book Review

Canadian Trade Index—annual 1929 edition, cloth, 884 pages, 6½ x 10¼ inches; published by the Canadian Manufacturers' association, Toronto, Canada, and supplied by THE FOUNDRY, Cleveland, for $6 plus 15 cents postage or in Europe by the Penton Publishing Co., Ltd., Caxton House, London, for 30s.

This book gives much information on the manufacturers and products of Canada. The first 138 pages and the last 82 pages are filled with advertising matter from different Canadian manufacturers. The first part of the book is a survey of Canada's export trade and a discussion of statistics. The second part of the index is an alphabetical list of Canadian manufacturers with their addresses, branch offices, factories, export representatives, etc. The third section is an alphabetical list of articles made in Canada with the names of the firms manufacturing them. A list of the principal exporters of agricultural produce arranged alphabetically by commodities constitutes the fourth part. The fifth section is a French translation of part III. Some statistics on the forty leading industries in Canada are appended.

Acquires Sales Rights for New Metal

W. D. Sargent, president, Eastern Steel Castings Co., Newark, N. J., has returned from a visit to Germany where he secured the American sales rights for a process for making a special type of iron castings from the German firms Heinrich Lanz, Mannheim; A. Borsig, Berlin; Thyssen, Gelsenkrichen; and the Esslingen Machine Works.

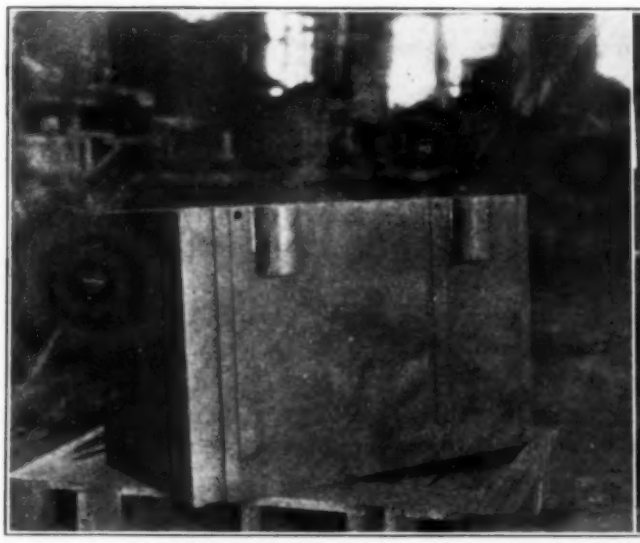


FIG. 5—PATTERN AND FOLLOWBOARD NOW EMPLOYED FOR MAKING THE CASTING SHOWN IN FIG. 1. FIG. 6—PATTERN AND COREBOXES EMPLOYED TO MOLD THE CASTING IN THE POSITION SHOWN TO THE LEFT IN FIG. 2

The Shakeout

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NORMAN F. HINDLE, Assistant Editor

¶ Tariff and Prices

MANY foundrymen are wondering, with the present changing attitude toward tariff matters, wherein their interests are likely to be affected. A point in the proposed Shipstead bill which will be presented, probably, at the short session of congress to be called this spring is likely to be of active interest to foundrymen. Article 2 under this proposed bill, covering oils and fats, proposes an increase in the tariff on linseed oil from the present scale of 25 per cent *ad valorem* to 45 per cent. Furthermore, the tariff on flaxseed from which linseed oil is pressed is to be advanced from 40 to 80 cents per bushel. Werner G. Smith, Cleveland, a large producer of core oils, has made a study of the matter and has presented to various congressmen several facts bearing on the effect of this proposed tariff on the price of core oil.

IT IS stated that the flaxseed produced in this country comes almost entirely from two states, North and South Dakota, where soil and climatic conditions are conducive to growing this product. Obviously, the intention of the proposed tariff is to give additional income to the farmers in these two states.

HOWEVER, the total production per year taken on 10-year average figures, shows only 16,800,000 bushels of flaxseed as the entire output of American farmers. Against this is a consumption of more than 45,000,000 bushels per year. The production of flaxseed in this country fluctuates rather widely and is dependent not alone upon price and demand, but upon a factor of agricultural practice known as crop rotation. In other words, the same plot of ground will not raise flaxseed two years in succession, but other crops must be planted to supply deficiencies in the soil created by growing flax. Therefore, the domestic production of flaxseed is not likely to be greatly increased by any such tariff measure as is carried in the proposed Shipstead bill.

Viewing the matter from the foundry standpoint, it will be noted that by applying a tariff the price of flaxseed will be directly affected. This in turn will react at once upon the price of linseed oil which is the basis of a large portion of the core oil used by all classes of foundries. In fact, it is said that from five to eight per cent of the total production of linseed oil finds its way into the foundries of America. With the advance in duty will come higher prices for linseed oil. This in turn will advance the price of core oil of this class.

Is this additional tax upon the foundry industry justified by the minor benefit likely to accrue to a limited number of farmers of our western states? The matter should have consideration of thinking foundrymen and associations acting in the interests of the foundry industry.

¶ Records Forecast

FORECASTING trends of business conditions in recent years has become an important link in the management of industry. Through a study of production records in certain lines of activity, it has been possible to predict probable business trends in other somewhat related industries with a remarkable degree of accuracy. Blast furnace production, building awards, automobile production railway car loadings and machine tool purchases are some of the records scanned for basic statistics.

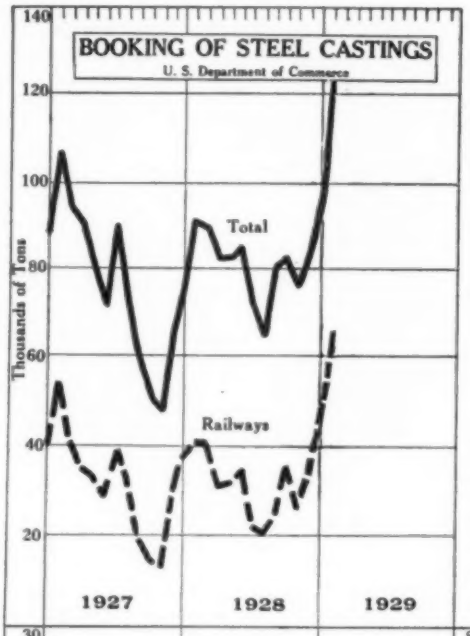
RECENTLY, the Gray Iron institute and a group of foundries in Worcester, Mass., have undertaken the collection of production statistics which may indicate trends in advance of other barometers now in use. The foundries in the latter group are engaged chiefly in the production of castings for machine tools, while the institute covers a diversity of foundries in a wide flung area. These monthly indexes would provide a base for valuable comparisons in making estimates of activity in industry. It will be interesting to note the accuracy of these production records from the foundry industry, as a forecast of general business conditions.

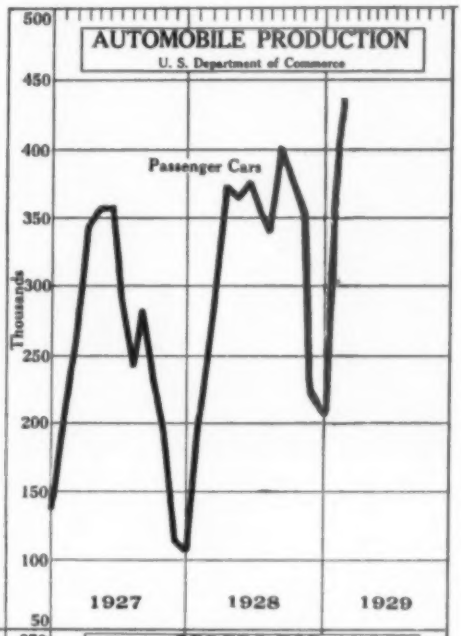
Trade Trends in Tabloid

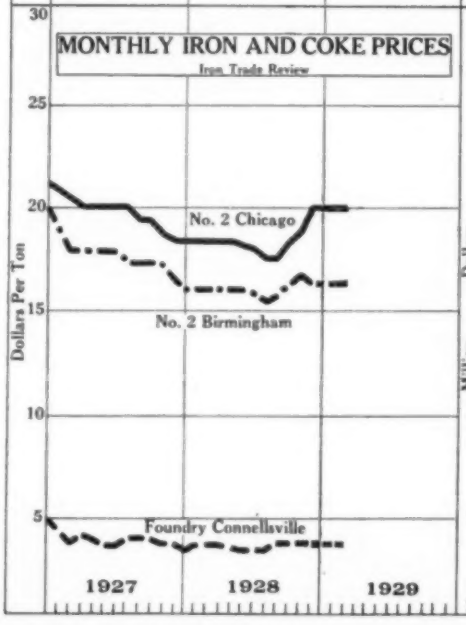
FOUNDRY business continues good. In automotive lines, many of the large shops constructed and operated by the manufacturers of automobiles are unable to meet demands for castings and iron cylinder, flywheel and gearcase castings are being ordered in increasing quantity from jobbing sources. Ford has returned to malleable for a portion of the rear axle on the new model, assigning as a reason the inability to secure sufficient quantities of forgings and welded parts. Machine tool sales have increased and foundries in New England, southern Ohio and other machine tool producing centers are active. Freight car demand is sustained by larger inquiries. Farm implement sales, particularly of harvesting machinery and tractors are heavy and promise continued activity in foundries making this class of work. Southern pig iron prices are off, but northern prices continue strong supported by heavy deliveries. Nonferrous metal prices are advancing. Copper has jumped nearly five cents a pound since March 15, although consumption does not seem to have brought about the shortage indicated by the prices. Brass and aluminum foundries making automotive work are extremely busy and plumbing goods demand is picking up with the advance of spring. Building construction awards indicate a continuance of demand for sundries and corresponding general castings.

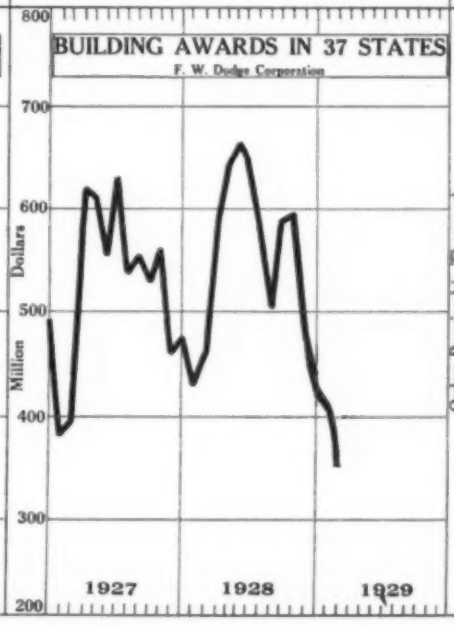
RAW MATERIAL PRICES
March 22, 1929

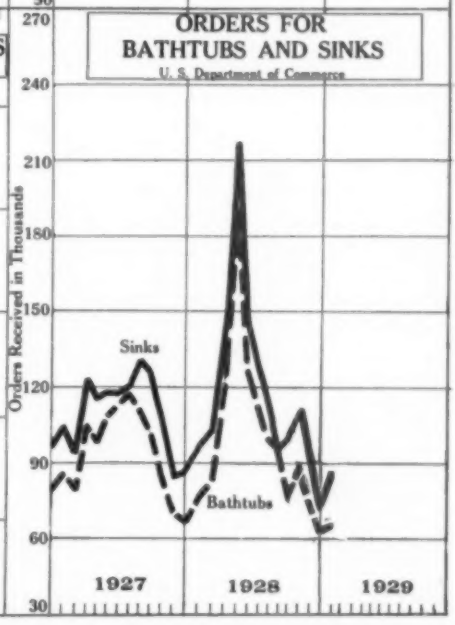
Iron	
No. 2 foundry, Valley	$18.50
No. 2 southern, Birmingham	15.50 to 16.50
No. 2 foundry, Chicago	20.00
No. 2 foundry, Philadelphia	21.76
No. 2 foundry, Buffalo	18.50
Basic, Valley	17.50 to 18.00
Basic, Buffalo	17.50
Malleable, Chicago	20.00
Malleable, Buffalo	19.00
Coke	
Connellsvile foundry coke	$3.75 to 4.85
Wise county foundry coke	4.25 to 5.00
Scrap	
Heavy melting steel, Valley	$18.00 to 18.50
Heavy melting steel, Pitts	18.00 to 18.50
Heavy melting steel, Chicago	15.50 to 16.00
Stove plate, Buffalo	14.75 to 15.00
Stove plate, Chicago	12.75 to 13.25
No. 1 cast, New York	13.00 to 13.50
No. 1 cast, Chicago	16.00 to 16.50
No. 1 cast, Philadelphia	16.00 to 17.00
No. 1 cast, Pittsburgh	15.25 to 15.75
No. 1 cast, Birmingham	14.00 to 15.00
Car wheels, iron, Pittsburgh	16.00 to 16.50
Car wheels, iron, Chicago	14.50 to 15.00
Railroad malleable, Chicago	18.50 to 19.00
Agricultural mal., Chicago	15.50 to 16.00
Malleable, Buffalo	17.50 to 18.50
Nonferrous Metals	**Cents per pound**
Casting, copper, refinery	22.50
Electro, copper, producers	23.00
Straits tin	49.37½ to 49.50
Lead, New York	7.80 to 8.00
Antimony, New York	9.75
Nickel, electro	35.00
Aluminum, No. 12, producers	23.00
Aluminum, No. 12, remelt	17.00 to 17.50
Zinc, East St. Louis, Ill.	6.60











Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

DANIEL C. EAGAN, formerly president of the Eagan-Rogers Steel & Iron Co., Crum Lynne, Pa., has become associated with the Deemer Steel Casting Co., New Castle, Del. Since graduation from Princeton University in 1906, he has been secretary of the Shenango Machine Co., Sharon, Pa., treasurer of

DANIEL C. EAGAN

the General Castings Co., Pittsburgh, and president of the Keystone Steel Castings Co., Chester, Pa. Mr. Eagan will devote his time to manufacture and sales for the Deemer Steel Casting Co., specializing in the production of carbon, manganese and alloy steel castings.

Charles A. Anderson Jr., formerly vice president in charge of sales of the Pittsburgh Valve Foundry & Construction Co., Pittsburgh, has been elected president, and A. V. Wadsworth, formerly manager of the Westcott Valve Co., East St. Louis, Ill., has been elected vice president and general manager of the Pittsburgh company. Mr. Anderson has been connected with the company for 21 years, serving in the production, purchasing and sales departments. He entered the employ of the Pittsburgh company following his college training, engaging in work in the foundry. During the war he was a first lieutenant in the ordnance department, stationed at Bethlehem, Pa. In August, 1918, he was placed in charge of the Liberty Ordnance Co., making 75 mm. shells and 5-inch navy rifles. He was made assistant general manager of sales of the Pittsburgh company in 1922, and since Jan. 1, 1923, has been vice president in charge of sales. Mr. Wadsworth was associated with the National Transit Co., Oil City, Pa., about 16 years. He later was identified with the Buckeye Traction Ditcher Co., Findley, O., the Pomeroy Machinery Co., Pomeroy, O., and recently with the Westcott Valve Co., of which he was secretary-treasurer and manager.

T. J. Cornwell has been elected president of the Peerless Foundry Co., Indianapolis. He succeeds the late William G. Williams, who, with Griffith W. Williams, founded the company in 1900. Frank Mutz was named vice president and treasurer and C. I. Carey, secretary. Mr. Cornwell joined the company in 1907 as a salesman.

Charles Seelbach, president of the Forest City-Walworth Run Foundries Co., Cleveland, has been elected treasurer of the Ohio Foundries association, Inc., to succeed E. Sands who resigned as treasurer and director.

Henry Johnson has been appointed foundry superintendent of the Pittsburgh Valve, Foundry & Construction Co., Pittsburgh. He formerly was identified with the Westcott Valve Co., East St. Louis, Ill., in a similar capacity.

G. C. Cole, formerly general foundry foreman with Danville Malleable Iron Co., Danville, Ill., has accepted a position with Herschel Mfg. Co., Peoria, Ill., as foundry superintendent.

E. J. Blair, who has been superintendent of the Lincoln Radiator Corp., Utica, N. Y., has been appointed to similar duties with the Utica Radiator Corp., Utica, N. Y., which has taken over the Lincoln plant.

Walter E. Sjoden has been appointed manager of the Birmingham plant of the American Radiator Co., succeeding A. D. Nichols, deceased. He has been superintendent of the plant for the past two years.

George Eaton Scott, since 1905 vice president of the American Steel Foundries, has been elected president of the company. He succeeds Robert P. Lamont, who resigned recently to become secretary of commerce in President Hoover's cabinet. Mr. Scott was born in St. Louis, where he started his business career with the Simmons Hardware Co. In 1901, he

GEORGE EATON SCOTT

went to Chicago as vice president of the Simplex Appliance Co. That company was acquired by the Ameri-Steel Foundries and in 1905 Mr. Scott became vice president. During the war he was drafted by Henry P. Davidson to serve in the American Red Cross and was with that organization from May, 1917, until April, 1919, serving as general manager and member of the war council. In 1919 he was elected a member of the executive committee on which he since has served. Mr. Scott is a director of H. Channon Co., Chicago, and the Griffin Wheel Co., Chicago.

J. R. Sheppard has resigned as chief engineer in charge of the hydraulic machinery department of R. D. Wood & Co., Philadelphia, to become sales engineer of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

W. M. Weir has been re-elected president of the Canada Foundries & Forgings Ltd. George P. Graham has

been re-elected vice president and E. S. Day reappointed secretary-treasurer.

J. E. Watson, vice president and general manager, Elliott Co., Jeannette, Pa., has also been made secretary and director of the Pittsburgh Die Casting Corp., Pittsburgh.

R. A. Cannon, manager of steel castings sales, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has been appointed vice president of the company.

Carl S. Neumann, recently was elected president of the Union Mfg. Co., New Britain, Conn., to succeed Albert F. Corin, resigned after serving in that office for 21 years.

J. W. Haynes, formerly connected with Plano Foundry Co., Plano, Ill., has been made superintendent of France Foundry & Machine Co., Toledo, O.

Edward B. Pollister, general manager of Busch-Sulzer Bros. Diesel Engine Co., St. Louis, has been appointed a member of the executive committee of the Foreign Trade bureau.

R. D. Klebes, for the past seven years assistant purchasing agent of American-La France & Foamite Corp., Elmira, N. Y., has been made purchasing agent.

H. P. Kreulen, formerly secretary, treasurer and general manager, Spring City Foundry Co., Waukesha, Wis., has been elected vice president and treasurer of the company.

R. H. Ripley, formerly second vice president of the American Steel Foundries, has been elected senior vice president to succeed G. E. Scott, who has been elected president.

Thomas Drevor, president of the Wahl Co., has been elected secretary and treasurer and a director of the American Steel Foundries.

Bernard H. Liskow, factory superintendent, Chevrolet Motor Co., Saginaw, Mich., has been elected president of the Saginaw Engineers' club.

Arthur L. Grede has been elected secretary of the Spring City Foundry Co., Waukesha, Wis.

Chauncey Belknap has been elected a director of the American Steel Foundries.

T. D. Lynch, consulting engineeer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been nominated for president of the American Society for Testing Materials. The election will be held by letter ballot and the results will be announced at the annual meeting to be held in June. Mr. Lynch represented the American society at the reorganization meeting of the International Society for Testing Materials, at Amsterdam, Holland, in 1927, at which he delivered the opening address, his subject being "Material Testing as a Stimulus to Research." He has been a member of the American society's executive committee for four years, being a director for two years and vice president for the past two years.

John H. Schwab has been made superintendent of the Plano Foundry Co., Plano, Ill. He formerly was with the Northwestern Foundry Co., Chicago.

R. R. Fauntleroy, president, Moline Malleable Iron Co., St. Charles, Ill., has been chosen president of the Malleable Iron Research institute, succeeding the late Frederick L. Sivyer. Mr. Fauntleroy served a number of years

HOWARD EVANS

ago as president of the American Malleable Castings association which was succeeded by the Malleable Iron Research institute.

W. W. Sherman, Electric Auto-Lite Co., Fostoria, O., has been elected a director of the Ohio Foundries association, Inc.

Distributes Film

Ajax Electrothermic Corp., Trenton, N. J., now has a film available showing the method of operation and the way electrical energy works in the high frequency furnace. Furnaces are shown in operation in the plants of Ajax Electrothermic Corp., Trenton, N. J., and Edgar Allen Steel Co., Sheffield, England. A comparison with the crucible method also is shown. Application of that type furnace to the heating of metals for forging and some views of the methods used in lining high frequency furnaces are included in the film.

Veteran Retires After 38 Year's Service

Howard Evans, secretary of the Philadelphia Foundrymen's association, since that body was organized in 1891, tendered his resignation on March 4 and retired from active connection with the foundry industry, an industry with which he has been connected during the entire period of his business career. In accepting the resignation the board of directors expressed regret that Mr. Evans through advancing years found this action necessary. As a token of appreciation for the many years of enthusiastic and faithful service in the secretarial office he was unanimously elected an honorary member of the association.

In early life Mr. Evans joined the staff of the J. W. Paxson Co., and remained consistently with this company until it went through a reorganization a few years ago. At that time he retired from business life, but kept up his official and semi-official connection with the foundry industry through his position as secretary of the Philadelphia Foundrymen's association. Since the beginning and particularly in later years, with more leisure on his hands, he has treated the work connected with the position as a hobby which has yielded him a great deal of pleasure and recreation. He is unmarried and for many years has made his residence at the Union League club.

In 1891 a small group of Philadelphia foundrymen decided to organize an association for the mutual benefit of all those in the district engaged in the manufacture of castings. Mr. Evans sat in at the council and unanimously was elected to notify all who might be interested. With the formal organization of the association he was elected secretary and has been re-elected to that office every year up to the present. He did the preliminary secretarial work in the formation of the American Foundrymen's association in 1896 and served as treasurer of this association from 1896 to 1900. His active participation, particularly in the entertainment features of the four conventions held by the American Foundrymen's association in Philadelphia, 1896, 1907, 1919 and 1927, brought him into contact with thousands of foundrymen from all over the country, all of whom hold him in high esteem.

National Air Filter Co., 1805 Foster avenue, Chicago, has been merged with the Reed Air Filter Co., Louisville, Ky. The headquarters of the company will be in Louisville.

Refractory Corporation Is Organized

Covell Corp., 1600 Walnut street, Philadelphia, has been organized to provide a new form of refractory construction which involves fire brick with lugs that hold the brick apart and the openings are filled with a refractory joint material projected into the joints by a cement gun. It is claimed that this method of construction can be applied to the linings of cupolas, open hearths, blast furnaces or any other units where refractory linings are used. The officers of the new corporation are: Charles E. Covell, formerly of the Austin Co., Cleveland, president; Earl D. Covell and Morris Kind, president, Hercules Portland Cement Co., Philadelphia, vice presidents; Arthur B. Murphy, secretary and treasurer. The directors include Harry L. Cox, Marion Steam Shovel Co., Marion, O.; William Fulton Kurtz, president, Colonial Trust Co., Philadelphia, and Earl L. Van Sciver, treasurer, Van Sciver Corp., Philadelphia.

A. P. Lee, for the past 7 years in charge of the foundry of William Sellers & Co. Inc., Philadelphia, and formerly associated with Perkins Machine Co., Warren, Mass., Standard Foundry, Worcester, Mass., Baldwin Locomotive Works, Eddystone, Pa., Pusey & Jones Co., Wilmington, Del., and Sun Shipbuilding & Dry Dock Co., Chester, Pa., has been appointed manager of the ceramic and refractory division of the corporation.

Company Makes Changes in Personnel

Several changes recently have been made in the officers and personnel of Osborn Mfg. Co., Cleveland. W. A. Rowe has been elected a director, vice president and treasurer of the company. Philip F. Smith has been made a director, assistant secretary of the company and factory manager of the brush division. C. W. Titgemeyer has been elected vice president in charge of the brush sales division. R. W. Hisey has been made secretary of the company and factory manager of the machine division. John D. Wise has been appointed assistant sales manager of the machine division, E. F. Oyster chief engineer, Ralph B. Jones assistant sales manager of the brush division and L. H. Weber, assistant advertising manager.

R. W. Hisey, factory manager of the machine division, was born at Milford, Ind., in 1890 and attended public school at Canton, O. After working for the Russell Engine Co., Massillon, O., for 5 years as secretary to the secretary of the company, he became connected with the Osborn company as secretary to the chief engineer. Later he was made assistant works manager.

John D. Wise, assistant sales manager machine division, was born at West Point, Miss., in 1895 and was graduated from Mississippi Agricultural and Mechanical college, Starkville, Miss., in 1915. He worked several years for Robbins & Myers Co. at Springfield, O., and then became connected with the Osborn company in 1919 as assistant to M. W. Zeman, sales manager. In 1921-22 he was superintendent of the foundry laboratory, University of Illinois, Urbana, Ill., but returned to the Osborn company in 1922.

JOHN D. WISE

E. F. Oyster, chief engineer, was born in Alliance, O., in 1883. He was connected with the Alliance Machine Co., Alliance, O., for 12 years and then became connected with the Osborn Mfg. Co. as chief draftsman. Later he was made mechanical engineer.

Buys Western Company

The Prest-O-Lite Co., New York, has acquired the business of the Acetylene Products Co. which operated two plants one located at 401 East Buchanan street, Phoenix, Ariz. and another at 914 Texas street, El Paso, Tex. Everett R. Kirkland is superintendent of the Phoenix plant and Carl F. Chesak is superintendent of the El Paso plant. R. G. Daggert, with headquarters at San Francisco, is the district superintendent.

Belgian Society Issues New Bulletin

The Syndicat General des Fondeurs de Belgique, the organization of which was announced in the Sept. 1, 1928, issue of THE FOUNDRY, now is publishing a monthly bulletin which started with the January number. This bulletin is published in co-operation with the Association Technique de Fonderie de Belgique. The publication contains articles covering the activities of the Belgian foundry industry in general, and of the Syndicat in particular. There also are articles relating to foundry practice.

Institute Expands

The Gray Iron institute, Terminal Tower building, Cleveland, Arthur J. Tuscany, manager, has elected the following companies to membership in the organization: H. W. Clark Co., Mattoon, Ill.; East St. Louis Castings Co., East St. Louis, Ill.; Illinois Foundry Co., Springfield, Ill.; National Foundry Co., Milwaukee; A. E. Martin Foundry & Machine Co., Milwaukee; Semi Steel Casting Co., St. Louis; Independence Stove & Furnace Co., Independence, Mo.; Virginia Foundry Co., Virginia, Minn.; LaPorte Foundry Co., LaPorte Ind.; Chambers, Bering, Quinlan Co., Decatur, Ill.; Superior Castings Corp., Norwalk, Conn.; Smith & Caffrey Co., Syracuse, N. Y.; Nortmann Duffke Co., Milwaukee; Wisconsin Gray Iron Foundry Co., Milwaukee, and Centre Foundry & Machine Co., Wheeling, W. Va.

Speaks to Foundrymen

George A. Richardson, manager of the technical publicity department, and R. L. MacDonald, foundry expert of the Bethlehem Steel Co., Bethlehem, Pa., were speakers at the regular March meeting of the Pittsburgh Foundrymen's association held in the Norse room of the Fort Pitt hotel, March 18. Mr. Richardson presented a paper describing a natural chromium-nickel bearing pig iron made by the Bethlehem company, and illustrated his talk with lantern slides.

Chicago Group Meets

C. J. Freund, Falk Corp., Milwaukee, chairman of the apprentice training committee of the American Foundrymen's association, addressed the March meeting of the Chicago Foundrymen's club March 7. His subject was "Apprentice Training in the Foundry.

Obituary

Fred H. Jarm, for the past ten years chief chemist and metallurgist for the Hubbard Steel Foundry, East Chicago, Ind., died March 7. Mr. Jarm was born Jan. 10, 1882, at Chicago. He started his business career with Chas. C. Kawin Co., Chicago, about 1906. After leaving this firm he became connected with the Farrell Foundry Co., now the Farrell-Birmingham Co., Ansonia, Conn. He served during the war and in 1918 became connected with the Hubbard Steel Foundry.

William Sheldon Dewing, founder of the Kalamazoo Stove Co., Kalamazoo, Mich., and until a short time ago its president, died recently. He was 83 years old.

Charles Ahrens, superintendent, Bowler Foundry Co., Cleveland, died March 3, from burns sustained when a stove exploded in his home earlier in the day. He was 67 years of age.

John W. Hayes, president of the Hayes-Custer Stove & Furnace Co., Bloomington, Ill., died at his home in Bloomington on March 14. He had been president of the firm since its organization in 1886.

Walter C. Arthurs, president and director, Mount Vernon Car Mfg. Co., Mount Vernon, Ill., died recently. He was a director of the Illinois Manufacturers' association, Chicago, and also of the Association of Manufacturers of Chilled Car Wheels.

Mrs. Eleanore Clark Wooster, proprietor of the Stamford Pattern & Model Works, Stamford, Conn., died March 14 at her home in Stamford, aged 49 years.

Hal C. Belville, former president and director of the Commonwealth Steel Co., Granite City, Ill., and more recently vice president of the Rothaker Film Co., St. Louis, died Feb. 25, aged 42. He had been ill for some time.

Edward Lupton, president of David Lupton & Sons, Philadelphia, manufacturer of steel products, died at his home in Jenkintown on Feb. 21. He was a past president of the Builders Exchange of Philadelphia and was third vice president of the Ornamental Iron and Bronze Association of America. He was 63 years old.

W. D. Uptegraff, chairman of the board of directors, Union Switch & Signal Co., Pittsburgh, and a director of the Westinghouse Airbrake Co., Pittsburgh, died recently at Niagara Falls, N. Y., at an age of 65 years. He had been connected with the Westinghouse company for almost 50 years and was financial and business agent of the late George Westinghouse from 1896 until his death in 1914.

Alexander A. Adamson, aged 72, president of the Akron Machine Co., Akron, O., producer of castings and manufacturer of patterns and hydraulic presses for the rubber industry, died at his home in Highland Spring, Akron, O., recently. He started his business career in Akron as a partner in a general machine shop in 1900, under the name of Adamson & Dennead. This firm later became the Adamson Machine Co.

Lane Johnson, chief engineer, United Engineering & Foundry Co., Pittsburgh, died at his home in Ingram, Pa., March 2. He was 52 years old. Mr. Johnson was a graduate of the Massachusetts Institute of Technology, Cambridge, Mass., and prior to his connection with the United company had a wide experience in an engineering capacity through his affiliation with a number of large steel and engineering companies.

Jesse J. Bowen, district sales engineer, Pangborn Corp., died at his home in Rochester, N. Y., recently, aged 57 years. Mr. Bowen was the first field representative of the Pangborn Corp., having joined the organization, Jan. 1, 1906. In his early days Mr. Bowen was a journeyman molder. He was well known in the foundry industry having at various times represented the Pangborn Corp. in New England, Illinois, Wisconsin, New York, Pennsylvania and Canada.

Exhibits To Show New Foundry Equipment

(*Concluded from Page* 290)

will be L. E. Dickson, J. J. Duffy, G. D. Carleton and Tremayne Hayden.

STANDARD SILICA CO., Chicago—A line of sandblast sands, core sand, furnace bottom and steel molding sands and silica washes will be shown. The company will be represented by A. C. Goodnow and R. W. McCandlish.

STERLING WHEELBARROW CO., Milwaukee—This company will show steel flasks, foundry wheelbarrows and other foundry specialties and will be represented by H. H. Baker, R. F. Jordan, J. J. Coyne, O. E. Steep, J. M. Dickson, G. H. Lambkin, J. A. Patterson, H. J. Felsburg, Ray Hunter and J. A. Morrissey.

STONE PATTERN MOUNT CO., Bloomfield, N. J. Match plates, squeezer plates, pattern mounts, etc. will be shown by C. W. Quast.

SWAN-FINCH OIL CORP., Chicago—Core oils and cores made with these oils, foundry facings, pneumatic tool lubricants, lubricants for other foundry machinery, core oven conveyors, monorails and other equipment will be featured by this company. Those in attendance will be Nelson V. Joyce, E. S. Burns, E. M. McQuillen, John Purvis Jr., James E. McCrummey, S. F. Musselman, E. F. Muther Jr. and Thomas E. Kennefick.

SWARTWOUT CO., Cleveland—A standard core oven will be shown at the booth of this company. Representatives will be C. F. Mayer, C. T. Pimsner, P. Kuehne and George S. Montgomery.

T

TABOR MFG. CO., Philadelphia—Molding machines including several new types will be featured by this company. The representatives will be Wilfred Lewis, F. R. Wallace, Robert M. Maull, J. Horace Coleman, H. W. Impey, William E. Sewell, T. L. Sumner and P. J. Shire.

TRUSCON STEEL CO., Cleveland—This company will show alloy steel flasks, bottom boards, core plates, boxes, platforms and other supplies. G. F. Sparks, H. W. Jencks, N. C. Ferreri, F. J. Vlaskamp, G. E. Madden, C. H. Watt, A. L. Abrahams, F. D. Winslow, H. A. Beattie and J. Skove will be in charge of the display.

W. S. TYLER CO., Cleveland—This company will show photographs and samples of reclaimed sand, reclaiming equipment, a testing sieve shaker, screen scale testing sieve and samples of woven wire cloth suitable for foundry use. M. D. Pugh, P. B. Buchanan and J. H. Jackson will be in charge.

U

UNITED COMPOUND CO., Buffalo—Vent wax and cores showing the use of that material will be shown. Pattern wax also will be included in the display. The representatives will be William F. Bradley and Leslie F. Leney.

UNITED STATES ELECTRICAL TOOL CO., Cincinnati—This company will exhibit its line of stationary and portable grinders.

UNITED STATES GRAPHITE CO., Saginaw, Mich.—Plumbago, core washes and other graphite products will be shown by this company. The representatives will be J. G. Drought, R. A. Corrigan, R. A. Nauer and O. R. Miller.

W

WADSWORTH CORE MACHINE & EQUIPMENT CO., Akron, O.—Steel reinforced core and bottom plates, sand and core testing equipment, and equipment for a special method of molding will be shown by this company. The representatives will be George H. Wadsworth and M. C. Sammons.

F. H. WHEELER MFG. CO., Chicago—A line of leather, asbestos, and fire proof duck wearing apparel for industrial use will be shown by this company.

WHITING CORP., Harvey, Ill.—Photographs, drawings, and miscellaneous equipment will be shown at the booth of this company. J. H. Whiting, T. F. Hammond, A. H. McDougal, M. J. Evans, R. E. Prussing and R. H. Moore will be in attendance.

WILLSON PRODUCTS INC., Reading, Pa.—This company will exhibit a line of safety equipment for industrial use.

G. H. WILLIAMS CO., Erie, Pa.—A foundry bucket model operating on a miniature overhead crane and a new type of heating torch will be shown by this company. The exhibit will be in charge of C. F. Weiblen, T. D. Harter and W. C. Swalley.

Y

YALE & TOWNE MFG. CO., Stamford, Conn.—A line of hoists and industrial truck equipment will feature the display of this company.

YOUNG BROTHERS CO., Detroit—Industrial oven equipment will be shown at the booth of this company.

Z

ZANESVILLE SAND CO., Zanesville, O.—Samples of molding sand for malleable, gray iron, brass and aluminum castings and specimen castings produced in these sands will be shown. The display will be in charge of F. G. Flegal and Harry M. Flegal.

What the Foundries Are Doing

Reflecting the Activities of the Gray Iron, Malleable, Steel and Brass Shops

Dayton Malleable Iron Co., Dayton, O., is building an addition to its Ironton, O., plant.

L. R. Zifferer is erecting a new malleable castings plant at Columbia, Pa.

A. J. Spencer Foundry & Machine Works, Dwight, Ill., had filed a voluntary petition of bankruptcy with the United States district court.

Erie Malleable Iron Co., Erie, Pa., has opened a branch at 701 Thrower building, Atlanta, Ga., with E. E. Dawes as district manager.

Algonac Brass Foundry, Algonac, Mich., has changed its name to Algonac Foundry Co. W. E. Warner is president.

Rome Electric Range Co., Huntsville, Ala., is installing machinery in the plant it recently built at Huntsville. (Noted Dec. 15).

General Steel Castings Co., Eddystone, Pa., has started work on the main foundry building of the new company. (Noted March 1).

Buckeye Foundry Co., Overpeck, O., suffered fire damage March 9. Owners of the company are Oscar Eberhart, Louis Hurm and John May.

Lycoming Mfg. Corp., Williamsport, Pa., has let the contract for structural steel for a building to Belmont Iron Works.

The United Engineering & Foundry Co. has moved its foundry department from the Frenk-Kneeland plant in Pittsburgh to Youngstown, O.

Enterprise Foundry Co., 320 Fremont street, San Francisco, is considering rebuilding the part of its plant recently destroyed by fire.

Decatur Foundry, Furnace & Machine Co., Decatur, Ind., gradually is increasing its capacity.

C. & G. Foundry & Pattern Works, 1026 Kentucky avenue, Indianapolis, has purchased the United Brass Works, Jones and Harding streets.

Paragon Die Casting Co., 3225 Ravenswood avenue, Chicago, has been incorporated with $50,000 capital by Frank Lannert, R. J. Scott, and Joseph Huska.

Messinger Mfg. Co., Tatamy, Pa., manufacturer of farming implements, is considering merging with foundries in New York, New Jersey and Pennsylvania.

France Foundry & Machine Co., Toledo, O., is remodeling its gray iron shop and building an addition to care for production and light jobbing work.

Federal Mogul Corp., Detroit, has established a die casting division, to be housed eventually in the 25,000-square foot addition being built to plant No. 1 in Detroit.

Fox Furnace Co., 206 Washington avenue, Elyria, O., plans the construction of a 1-story addition to its foundry and plant, 101 x 119 feet.

National Sash Weight Corp., 200 Key Highway, Baltimore, incorporated recently, will manufacture sash weights, counter and elevator weights, etc. Nothing definite has been decided about buildings as yet. (Noted March 15).

Board of education, Cleveland, F. S. Hogan director, has awarded the contract for the construction of a foundry and trade school, to H. F. Jurgens, 15430 Edgewater drive.

Landon Radiator Co., North Tonawanda, N. Y. plans the construction of a 1-story building, 183 x 250 feet, to be used as a shop and warehouse.

City Pattern Works, 1145 Harper avenue, Detroit, Fred J. Coulton secretary, plans the construction of a 1 and 2-story plant addition and alterations.

The Michigan Valve & Foundry Co., Detroit, has been incorporated with 5000 shares no par value stock to engage in a general foundry and metal manufacturing business.

Johnson & Jennings Co., 104 North Solvay avenue, Detroit, has awarded the general contract for the construction of a foundry to Bennage & McKinistrie, Detroit.

Wisconsin Gray Iron Foundry Co., Thirty-ninth avenue and Burnham street, West Milwaukee, is building a foundry addition and making some alterations for greater capacity.

Dominion Radiator & Boiler Co., 1322 Dufferin street, Toronto, Ont., has taken a permit for the erection of a cupola building and other additions to its plant. Construction work is under way.

Central Pattern & Foundry Co., 3737 South Sacramento avenue, Chicago, has been incorporated by Good, Childs, Bobb & Westcott, 231 South La Salle street, to engage in a general foundry and machine shop business.

Rundle Mfg. Co., Twenty-seventh street and Cleveland avenue, Milwaukee, has awarded the contract for concrete reinforcing bars for a foundry and enameling building at Camden, N. J., to Taylor, Davis Inc. (Noted March 1.)

Malden Bronze Foundries Inc., Boston, has been incorporated with 5000 shares no par value stock to manufacture statuary, ornamental bronze, etc., by Charles V. S. Paul 722 Commonwealth avenue.

The Erie Foundry Co., Erie Pa., has bought from the Beaudry Co. Inc., Boston, its line of motor-driven air hammers. The purchaser plans to develop and enlarge the line to 2500 pounds capacity.

Syracuse Bronze Co., Syracuse, N. Y., incorporated recently, will manufacture bronze, brass and aluminum castings. The company has rented a plant and is not in the market for machinery or equipment.

Peerless Iron Works, Second and C streets, West Sacramento, Calif., plans the construction of a 1-story plant including a machine shop 56 x 96 feet; pattern shop, 30 x 40 feet and foundry, 52 x 64 feet.

Eckman & Anderson Foundry & Machine Co., Sterling and Larue streets, Streator, Ill., has been incorporated with $10,000 capital by H. R. Hoffman, M. W. Eckman and W. R. Anderson to do general foundry and machine work.

Maynard Steel Casting Co., Milwaukee, has started work on a shop addition, 120 x 600 feet. The new addition will cost about $200,000 including the necessary equipment. Frank J. Wabiszewski is general manager.

Hubley Mfg. Co., Lancaster, Pa., has completed the construction of an office building and now is working on the plans for an addition to its foundry that will give additional space for 40 molders.

J. C. Barrett Co., 516 Asylum street, Hartford, Conn., manufacturer of metal patterns, etc., has acquired a two acre tract of land at Elmwood, Conn., and plans the construction of a 2-story plant, 40 x 100 feet. The new plant will cost about $40,000 with equipment.

Eagle Bronze Works, 10 East Bleecker street, Mount Vernon, N. Y., soon will take bids on a general contract for an addition to cost about $45,000. The contract also includes improvements to the present plant. G. M. Bartlett, 103 Park avenue, New York is the architect.

King Metal Products, Anniston, Ala., has been incorporated with $25,000 capital to manufacture various kinds of steel castings by T. C. King president and general manager. The company will be located on the site of the old National Forge Co., South Anniston.

Western Implement Mfg. Co. Ltd., Calgary, Alta., has been incorporated with $250,000 capital by Percy L. Sanford, Alexander H. Everett, James Chambers and others all of Calgary., to manufacture and deal in machines, tools, etc., and to carry on the business of iron founder, and metal worker.

Pittsburgh Gray Iron Foundry Co., South and Walker streets, Pittsburgh, is completing plans for a one-story addition, 35 x 150 feet. The cost of the new addition and equipment is approximately $70,000. Hunting, David & Dunnells, Century building, Pittsburgh, are the architects and engineers.

National Bronze & Aluminum Foundry Co., Cleveland, J. H. Shafner, president, has started the erection of an addition to its plant that will increase the present capacity 50 per cent. Equipment has been purchased but more will be required before the new building is entirely utilized.

Detroit Alloy Steel Co., Detroit, recently formed by Hugh Martin, head of the Detroit Gray Iron Foundry Co., 6403 Wright street, Detroit, has established a plant at the foot of Iron street to manufacture alloy steel products, die castings, etc., Harry H. Wyatt is secretary and treasurer.

Allied Die Casting Corp., Long Island City, N. Y., has taken a 21-year lease on a proposed 4-story concrete factory, to be erected by Shampan & Shampan, architects, on a 100 x 180-foot site extending from the northeast corner of Forty-third avenue and Thirty-eighth street to Thirty-ninth street. The proposed building will cost approximately $400,000 and will contain 75,000 square feet.

Winnipeg Brass & Fixture Co., Winnipeg, Man., changed its name to Winnipeg Brass Ltd. The company which was established as a partnership in 1910 continued to operate under this arrangement until May 1, 1928 when it was incorporated. A. G. Burton is president and general manager, A. E. Garbut, vice president and general superintendent, and C. L. Williams is secretary.

Foundry business among the cast iron toy manufacturers in the Lancaster, Pa., district is good. The plants that are active in the production of cast iron toys are U. S. Hardware Co., Columbia, Pa.; Gray Iron Castings Co., Mt. Joy, Pa.; Susquehanna Castings Co., Wrightsville, Pa.; Wrightsville Hardware Co., Wrightsville, Pa., and the Andes Foundry Co., Lancaster, Pa.

The Krone-Sebek Die Casting & Mfg. Co., 664-66 West Austin avenue, Chicago, has quadrupled its plant headquarters through the purchase of the former plant of the Fiel Mfg. Co., West Forty-seventh street and Richmond avenue, Chicago. The new property consists of a one and two-story building covering ground 100 x 300 feet and containing 54,000 square feet of working space. The company manufactures radio and automotive equipment and die castings for dies for ornamental equipment, as well as brass and aluminum castings.